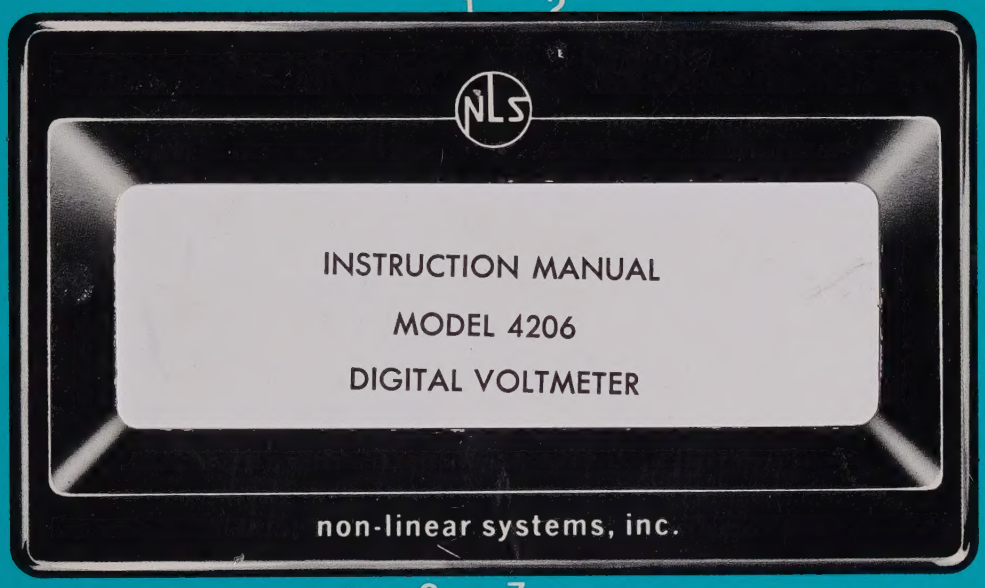
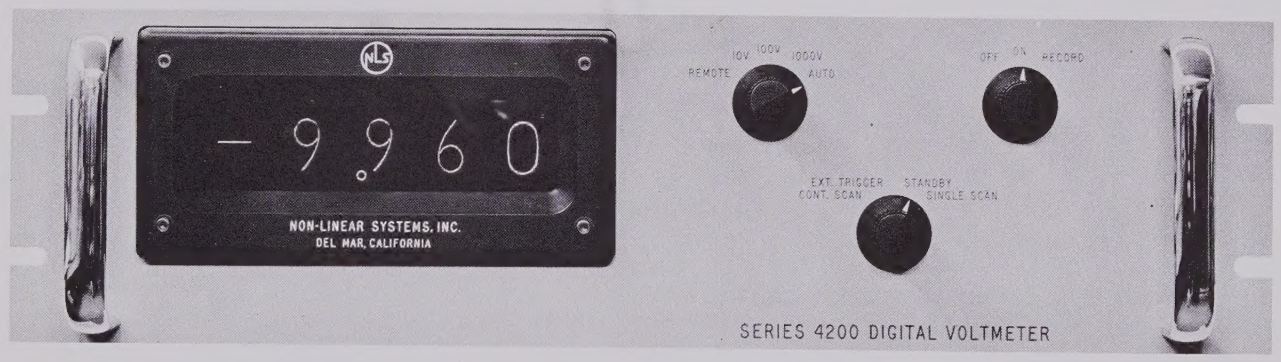


non linear systems, inc.

DEL MAR, CALIFORNIA

Document No. 586A
August 1965

INSTRUCTION MANUAL
MODEL 4206
DIGITAL VOLTMETER



This manual is for instrument Serial No._____

Originator of the Digital Voltmeter
non-linear systems, inc.
DEL MAR , CALIFORNIA

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CHAPTER I

INTRODUCTION AND SPECIFICATIONS

The NLS Model 4206 Digital Voltmeters are designed for users who require a highly accurate, easily - maintained instrument possessing a high order of reliability.

Although presented in greater detail elsewhere in this manual, the leading particulars of these instruments are here summarized to illustrate how NLS has met user demand, and to familiarize the reader with the instruments.

ACCURATE AND STABLE

For maximum accuracy and stability, the Model 4206 operates as an automated version of the laboratory potentiometer, the most accurate voltage measuring device. That is, it generates a feedback voltage equal to the unknown input in discrete steps, by operating a precision voltage divider, energized by a highly regulated power supply.

High-speed, reliable transistor switches operate the Model 4206's voltage divider, which is composed of precision resistors. The switches are so stable that adjustment potentiometers are not required to compensate for switch drift. Power supply for the divider is regulated by Zener diodes which have been carefully selected, aged for hundreds of hours, then matched for precisely equal temperature coefficients. The result is an ultra-stable voltage supply which requires no temperature stabilizing oven.

EASY TO SERVICE

Virtually all components are mounted on plug-in circuit boards for easiest access and replacement. No parts are mounted under the main chassis. It is thus possible to keep the Model 4206's operative with a minimum of down time. Hours spent in troubleshooting activities are now replaced by minutes spent in module replacement. For example, logic and feedback voltage generator circuits common to any one decade (readout window) are mounted on a separate board and these four decade boards, having over 330 parts, are completely interchangeable within the instrument. They can be interchanged instantly in troubleshooting. Should any decade board fail, it can be omitted from the right-most decade, and the Model 4206 will still operate, but as a 3-digit instrument (e.g., if the input were 4.649, the readout would display 4.64). This maintenance philosophy enjoys wide acceptance among instrument users who require that both trained and untrained personnel be able to service the instruments.

MEASURING SPEED

The speed of the Model 4206 instrument, depending upon range changes required, will vary from 50 to 150 milliseconds per reading. Automatic polarity changes will not affect the speed. Range changes occur when the previous measurement is not within the proper range for the new measurement; that is the range changes only when required. Unlike many other instruments, the Model 4206 does not revert to the lowest range between readings.

"Range Memory" increases over-all measuring speed by preventing needless ranging. It does this by remembering the range last used and using it for the next measurement if suitable (that is, if the next voltage is neither above full scale of the range last used, nor lower than 1/10 of it).

A Model 4206 performs any required ranging rapidly because it doesn't rigidly follow a lo-mid-hi range seeking sequence each time it ranges. Instead, it automatically programs itself through the fastest of the six sequences possible using continuous ranges: lo-mid-hi, hi-mid-lo, mid-hi, mid-lo, hi-mid and lo-mid.

The prescribed sequence logic (scan logic) used in the Model 4206 increases over-all speed by measuring in a fixed time. With this logic, the DVM creates a feedback voltage equal to the input, and feedback voltage changes are made decade by decade in one programmed scan, starting with the left-most decade (left-most readout window) and progressing to the right. Even if the input voltage varies during measurement, the instrument's reading represents a valid voltage value that existed during the measuring cycle. In contrast, DVM's having digital servo logic (tracking logic) will "hunt" continuously as long as the input varies by more than one digit. Hunting can only be stopped by decreasing DVM comparison amplifier gain, which must be done manually since the gain should be reduced only enough to prevent hunting.

COMMON MODE REJECTION

Rejection of common-mode signals, those caused by AC or DC currents flowing between signal source ground and instrument case ground, is a key feature of the Model 4206 DVM. Common-mode signal rejection (CMR) is important in a wide range of applications - testing complex electrical and electronic systems, in automatic measuring systems, and measuring outputs from thermocouples, strain gages and other transducers where common-mode signals may be many times greater than the measured DC voltage.

In the Model 4206, 60 CPS common-mode signals up to 1,000 times greater (60 DB) than the input have no effect upon measurement accuracy even with up to 1,000 ohms source unbalance in either side of the input line because the measuring circuits are isolated from the outer case by a metal guard shield that breaks the common-mode current loop, and the power supply is isolated from the power line.

FLOATING INPUT

Because input signal leads are not connected to the Model 4206's outer case, signal-to-case potentials up to 500 volts are tolerable. Floating input adds to the DVM's versatility by permitting it to measure voltage sources which could not be accurately measured by a non-isolated meter.

The NLS Sales Representatives or Engineering Department will be pleased to assist you with specific application problems and, of course, will gladly welcome your comments and suggestions. A contact with the nearest NLS office or to the main office in Del Mar, California will bring prompt response.

SPECIFICATIONS

RANGES:	±9.999/99.99/999.9 volts. Consult NLS regarding voltage ratio measurement.
READOUT:	4-digit, in-line, NLS dot-engraved, edge-lighted, plastic plate-type for high contrast and low eye fatigue.

POLARITY SELECTION:	Automatic. Polarity change does not affect measurement speed.
RANGE SELECTION:	Automatic, manual and remotely programmable.
SPEED:	Without range change: 50 millisec/reading (Polarity change included) not involving a range change. When making repetitive measurements in auto range mode, range changes only when input voltage falls outside of the range in use. With range change: 100 millisec/reading (10 readings/sec.) for reading requiring one range change. 150 millisec/readings in two range changes. Range changing sequences: low - middle - high, high - middle -low.
STARTER TRIGGER:	A manual, remote (-12-volt pulse), or internally clocked (20/sec.) "scan-trigger" starts each measurement.
ACCURACY:	± (0.02% of full scale + 1 digit).
RESOLUTION:	± 0.01% of full scale on each range.
INPUT IMPEDANCE:	10 megohms. Impedance may drop to 1 megohm if input voltage exceeds range selected.
DIGITAL OUTPUTS:	Decimal (10-line/decade) or BCD (1-2-4-2 code) voltage levels are available. True = 0 volts; False = -12 volts. For other code options, consult NLS.
COMMON-MODE REJECTION:	Case-within-a-case construction and a well-shielded power transformer are used to obtain high common-mode rejection and ground isolation. The instrument rejects AC common-mode noise by at least 60 DB at 60 CPS.
PRIMARY POWER:	115 (±10 volts), 60 CPS, 60 watts. 230 VAC may be used if power transformer primaries are wired in series as shown in Schematic Drawing No. 42-62, Sheet 3.
DIMENSIONS:	5-1/4 IN. high, 19 IN. deep (not including connectors), for mounting in standard 19 IN. wide rack or for bench use.
WEIGHT	Approximately 40 lbs.
CONSTRUCTION	Plug-in printed circuits mounted on 3/32 IN. epoxy fiberglass circuit boards.

Specifications Are Subject To Change Without Notice

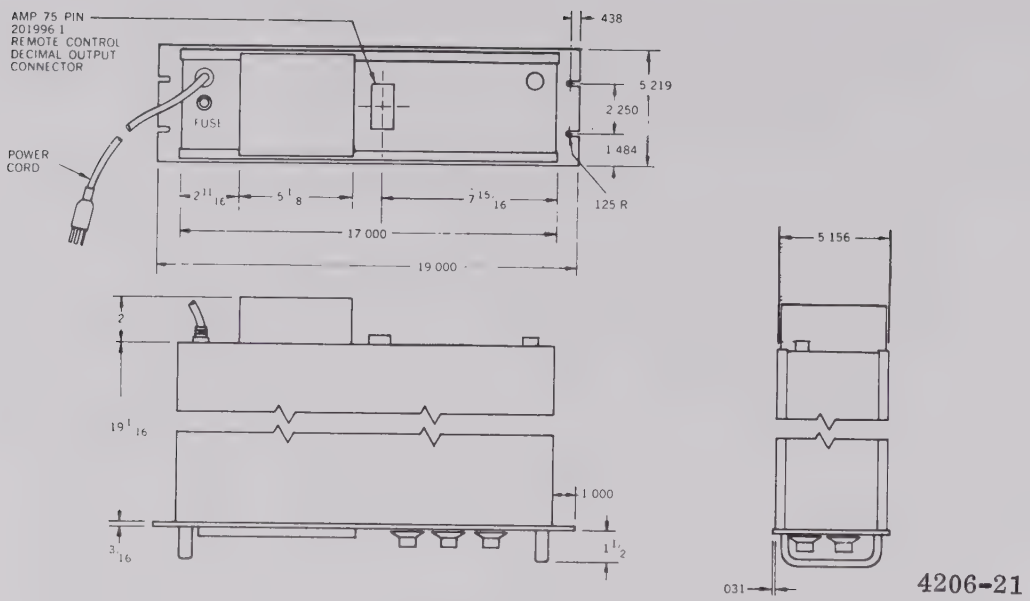


Figure 1-1. Dimension Diagram

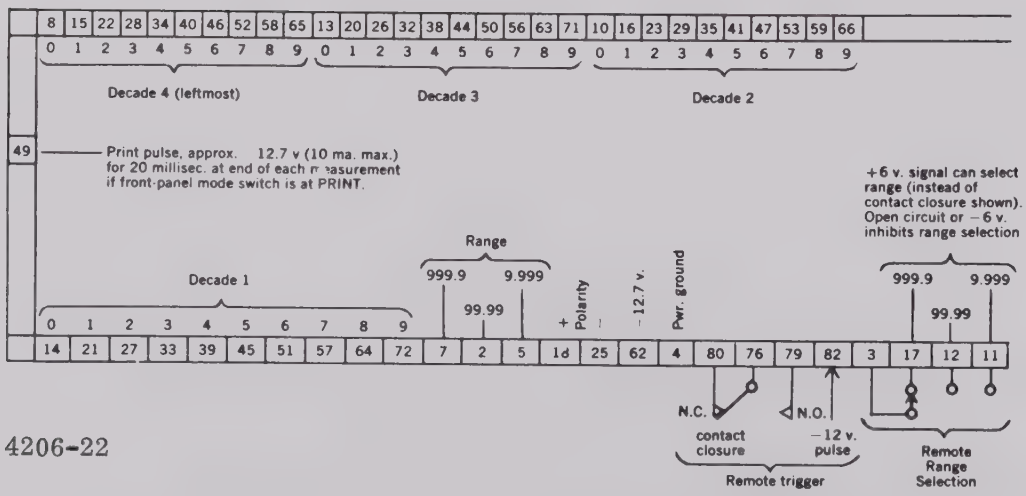

8 15 22 28 34 40 46 52 58 65 13 20 26 32 38 44 50 56 63 71 10 16 23 29 35 41 47 53 59 66
0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9
Decade 4 (leftmost)
Decade 3
Decade 2
49
Print pulse, approx. 12.7 v (10 ma. max.) for 20 millisec. at end of each measurement if front-panel mode switch is at PRINT.
+6 v. signal can select range (instead of contact closure shown). Open circuit or −6 v. inhibits range selection
Range
Decade 1
999.9
9.999
99.99
0 1 2 3 4 5 6 7 8 9
+ Polarity −
−12.7 v.
Pwr. ground
14 21 27 33 39 45 51 57 64 72 7 2 5 1d 25 62 4 80 76 79 82 3 17 12 11
N.C.
N.O.
contact closure
−12 v. pulse
Remote trigger
Remote Range Selection
4206-22

Figure 1-2. Digital Output and Remote Control Connections

CHAPTER II

INSTALLATION AND OPERATION

This chapter provides information on unpacking and installing the instrument and describes the functions and method of operating each of its controls.

UNPACKING

Instruments are shipped in two-piece polystyrene-bead containers. The interior contains four polystyrene corner pieces which support the instrument. The unit itself does not contain any packing material and is ready for operation as received. It is recommended that the container be saved if the instrument is to be shipped at a later date or if it is to be stored. If any damage is evident, promptly notify the carrier.

INSTALLATION

The unit will perform as a bench instrument or may be easily placed in a standard 19-inch instrument rack.

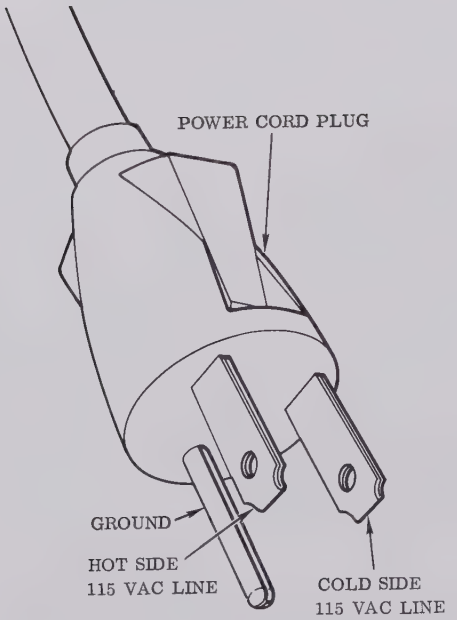


Figure 2-1. Power Plug Pin Coding

POWER SOURCE

The instrument is usually furnished for operation from conventional 115-volt, 60-cycle power source. A 230-volt AC source may be used if the two primaries of the power transformer are wired in series. When making this change, keep in mind that the cooling fan is rated at 115 volts AC and must be paralleled with one winding of the power transformer pin connections when adapting the instrument to 230-volt operation. Drawing No. 42-62, Sheet 3 shows the method of modifying the instrument for 230-volt operation.

POWER GROUNDING

The third pin on the power plug (Figure 2-1) grounds the outside chassis of the instrument. The internal case, hereafter referred to as the "guard" shield, is isolated from the power source and from the outer chassis ground.

INPUT CONNECTOR

The input cable is shown in Figure 2-2. The red plug is signal high; black is signal low; yellow is connected to the "guard" shield of the instrument

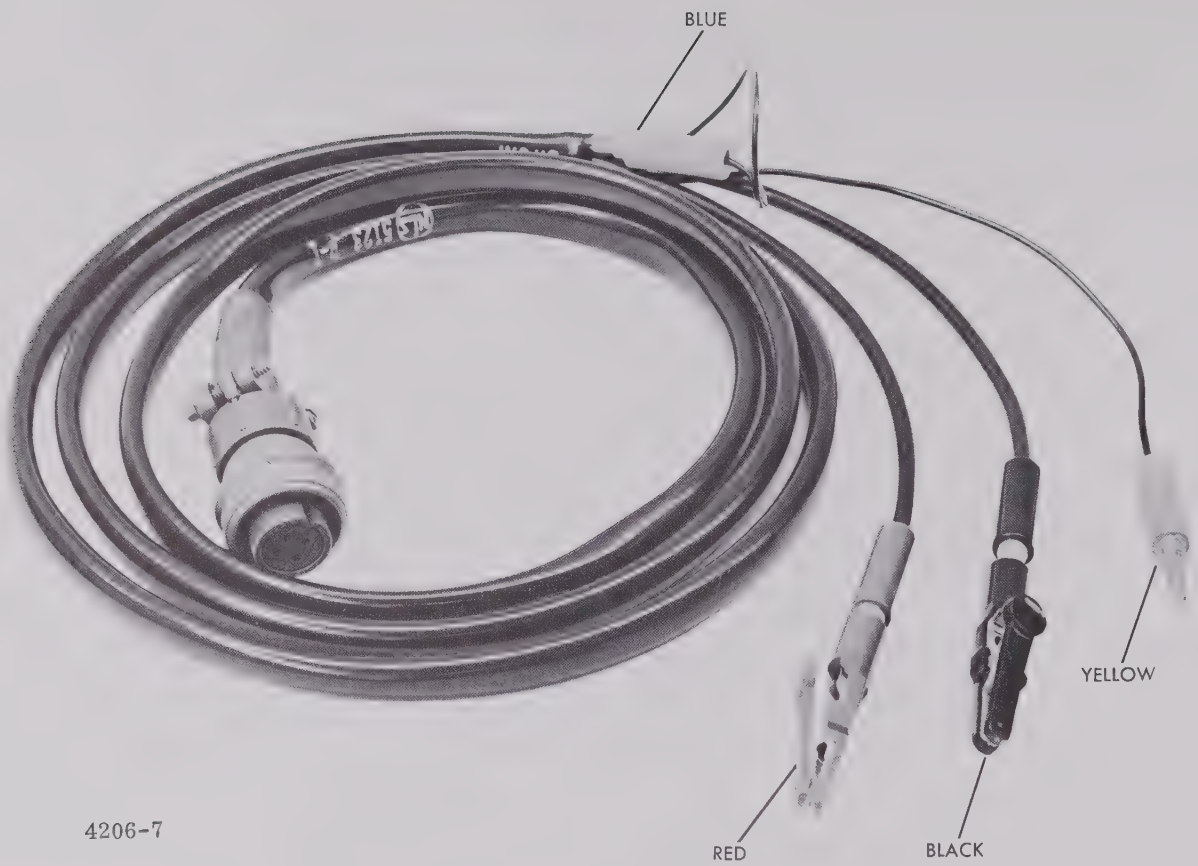


Figure 2-2. Input Cable

and blue is connected to the outer chassis (Figure 2-3). The "guard" shield is isolated from the circuits within the voltmeter. For maximum shielding effectiveness and greatest common-mode rejection, the "guard" shield should be connected to the signal ground. The input cable is connected to the four-pin Amphenol connector located on the rear of the instrument (Figure 2-4). A potential up to 500 volts may be tolerated between the outer chassis and the signal low.

CONTROLS

The following paragraphs describe the functions of each position of the three switches located on the front panel of the instrument. (See figure 2-5.)

The POWER switch has three settings:

OFF -- The instrument is de-energized and both power leads are isolated from the power source; however connection is maintained between the outer case and AC power line ground.

ON -- In this position, the instrument is ready to provide readings. For maximum specified accuracy, a warm-up period of 30 minutes is recommended.

RECORD -- This position is used to operate external printers and punches.

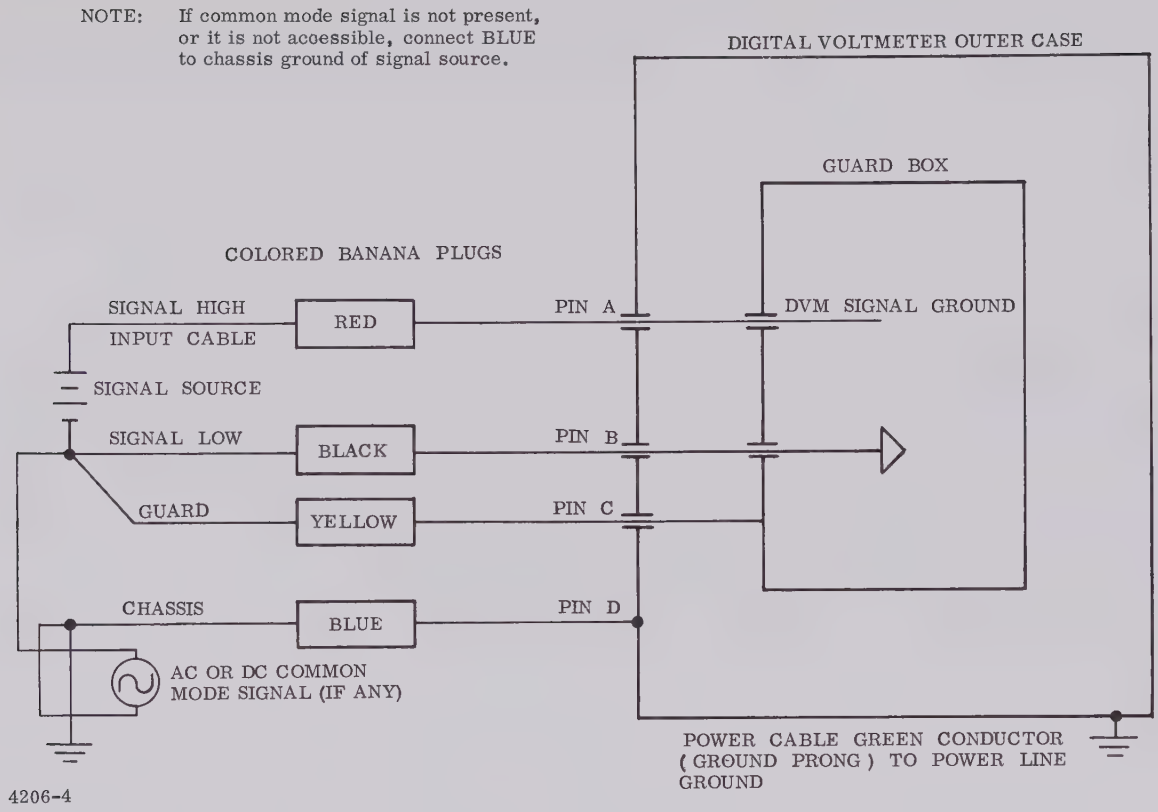


Figure 2-3. Input Connections

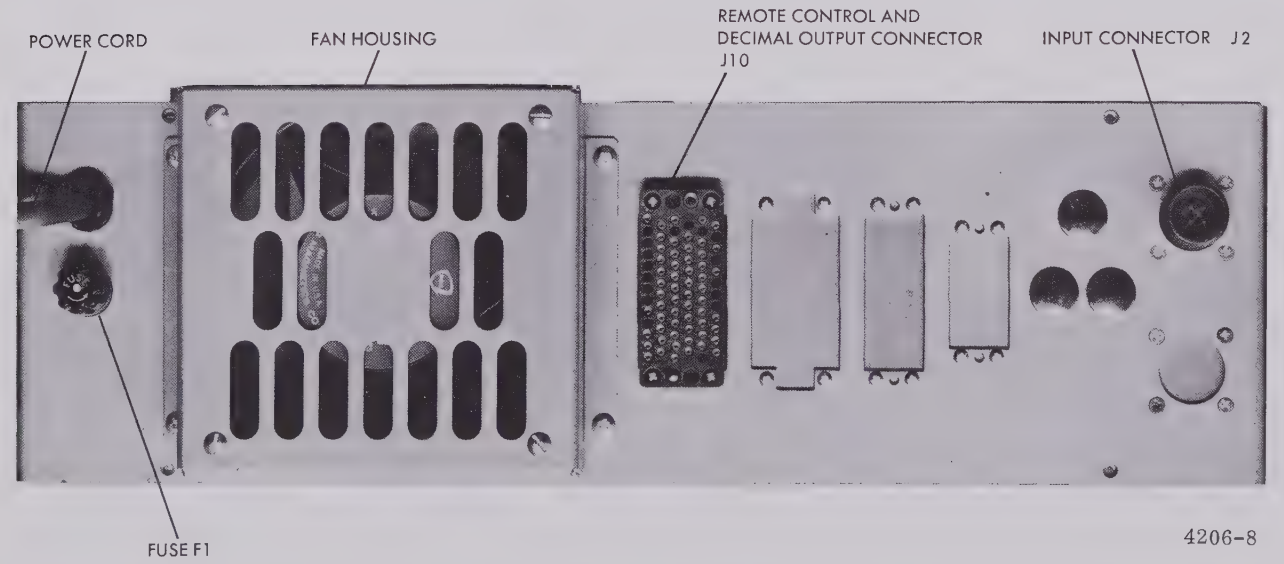


Figure 2-4. Rear View Showing Cable Connectors

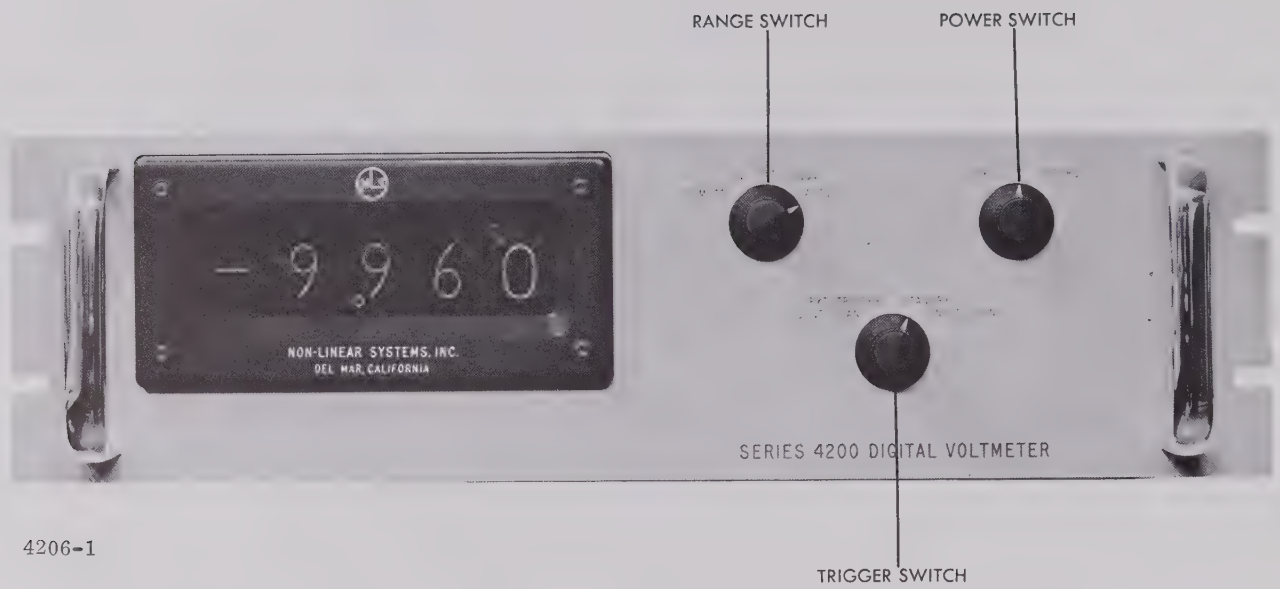


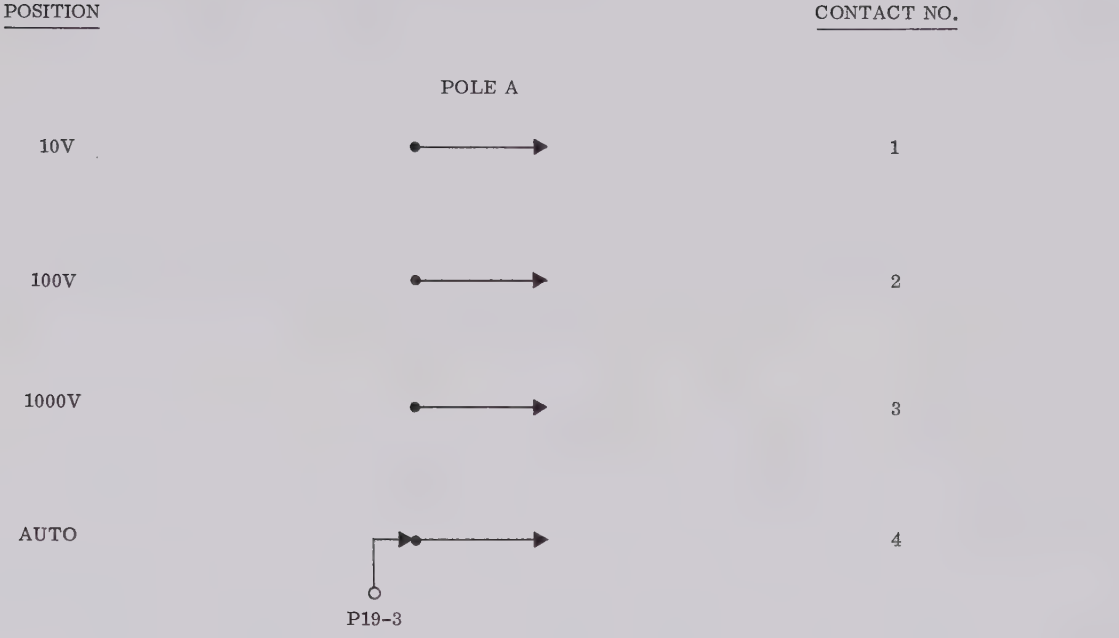
Figure 2-5. Front Panel

The RANGE switch has five positions:

REMOTE	--	This position allows control of the other four positions of the RANGE switch from a remote switching circuit which is connected to the 75-pin connector on the rear of the instrument. Connection points are shown in figure 2-6.
10V, 100V, 1000V	--	These positions are used to fix the maximum voltage which will be read. When these maximums are exceeded, the instrument will display all nines. Up to 1100 volts may be applied to any range without damage.
AUTO	--	This position causes the instrument to select automatically the appropriate range for the input applied.

The TRIGGER switch has four positions:

CONT. SCAN	--	This position allows the instrument to operate at the full rated speed and to change its display at the maximum specified rate in the presence of a varying voltage. Also, an unchanging input will be scanned at the maximum rate.
EXT. TRIGGER	--	This position allows the instrument to make only one computation and arrive at one reading which is held until an external command is applied (through the 75-pin connector on the rear of the instrument) to "tell" the instrument



NOTE:
P19 is the mating connector of J10 shown on the Model 4206 wiring diagram, no. 42-62, sht. 3 4206-32

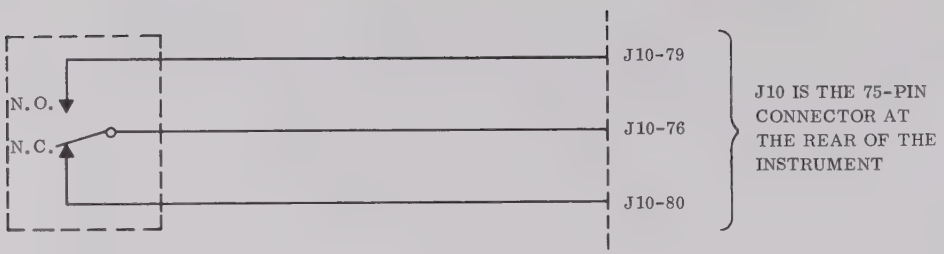
Figure 2-6. Range Switch Connection Points

EXT. TRIGGER (Cont) -- to compute and display one more time. This position is often used to synchronize the speed of a printer or punch (equipped with appropriate contact closures) with the digital voltmeter. See figure 2-7 for triggering information.

STANDBY -- When the TRIGGER switch is set at STANDBY, the starting circuits cannot be triggered, and therefore the instrument can make no measurements.

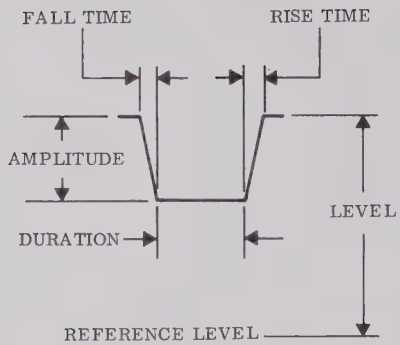
SINGLE SCAN -- If the TRIGGER switch is turned to the SINGLE SCAN position, the instrument will make a single scan, or measurement. There is no detent in the SINGLE SCAN position, and a spring returns the TRIGGER switch to the STANDBY position upon release of the knob. Before each measurement made in the single scan mode, the TRIGGER switch must be allowed to return to STANDBY. The operation of the starting circuits in SINGLE SCAN is the same as for EXTERNAL contact closure.

A



FORM C
BREAK-BEFORE-MAKE EXTERNAL CONTACT

B



REFERENCE LEVEL: SIGNAL GROUND

	PULSE SPECIFICATIONS			
	UNIT	MINIMUM	NOMINAL	MAXIMUM
AMPLITUDE	VOLTS	10.8	12.7	20.0
LEVEL	VOLTS	—	—	±100
FALL TIME	μSEC	0	—	10
DURATION	μSEC		—	∞
RISE TIME	μSEC	0	—	∞

THE INSTRUMENT MAY BE TRIGGERED TO START A MEASUREMENT IN ANY ONE OF THE FOLLOWING FOUR WAYS:

1. If it is desired to start the instrument automatically, set the trigger switch (located on the front panel) at "Continuous Scan." The instrument will then continue to make measurements.

2. To make a single measurement under manual control, rotate the trigger switch from "Stand-By" to "Single Scan." To make another single measurement, rotate the trigger switch to "Stand-By" and then to "Single Scan."

3. To start a measurement under control of a remotely located "Form C" break-before-make contact closure, make connections as shown in "A"; set the trigger switch to "External Trigger." A measurement can then be started by moving the armature of the external contact device from the normally-closed contact to the normally-open contact. Before another measurement can be started, contact must be made between the armature and the normally-closed contact.

   Note: Capacitance to earth of the external-contact device and its associated leads can reduce the common-mode rejection capability of the instrument.

4. To start a measurement by an external pulse:
   a. Set the trigger switch to "External Trigger."
   b. Connect a jumper from J10-76 to J10-80 at the rear of the instrument.
   c. Apply a negative pulse having the characteristics shown in "B" to J10-82. Each pulse starts one measurement.

4206-3

Figure 2-7. Triggering Information

CHAPTER III

THEORY OF OPERATION

A block diagram, showing the overall operation of the Model 4206 Digital Voltmeter, is presented in figure 3-1. Block diagrams and schematic diagrams of individual circuit board assemblies will be found, in numerical sequence, at the end of this manual.

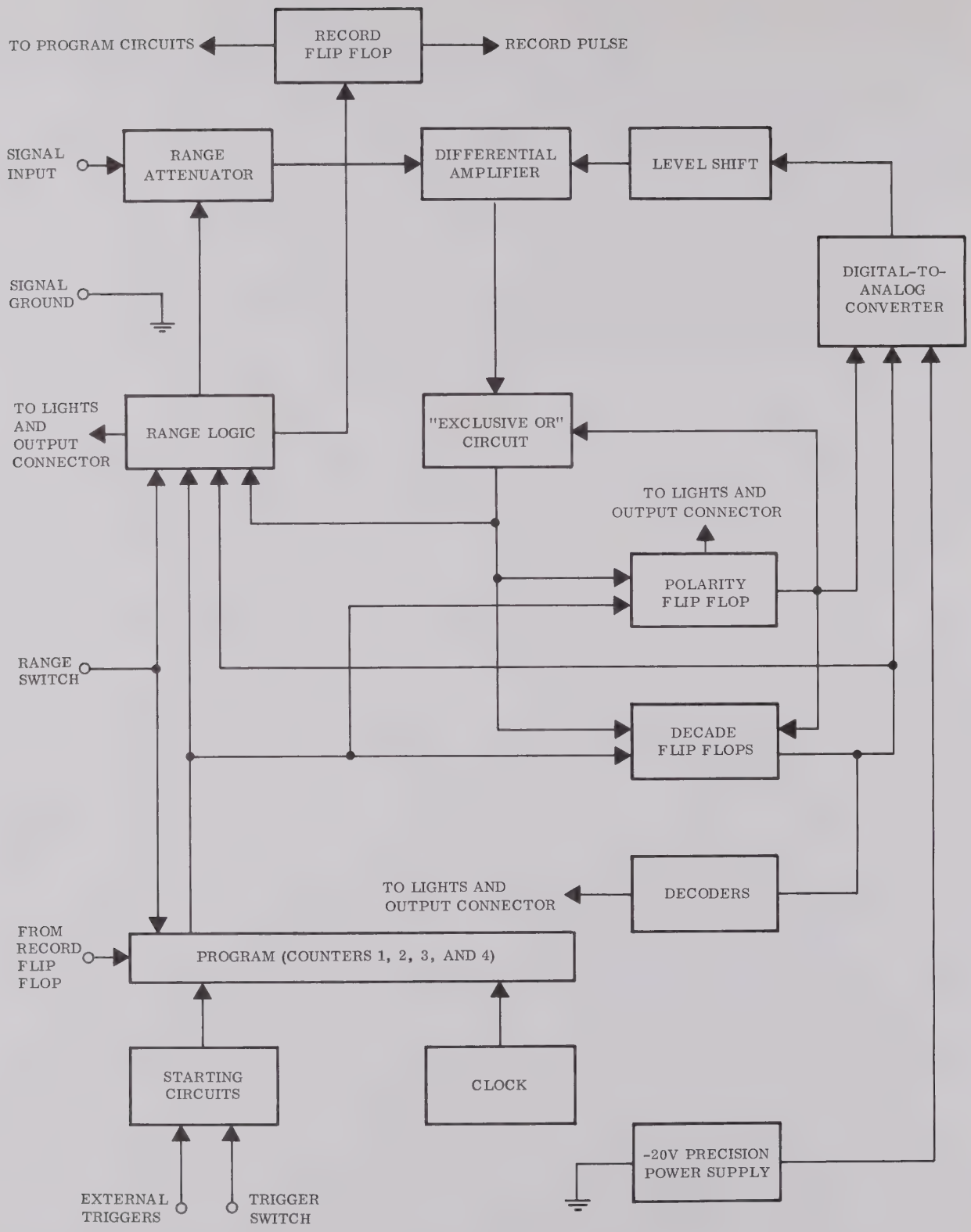
BASIC THEORY

The Model 4206 DVM uses the potentiometric comparison method to measure unknown voltages. This method requires a voltage comparator and a comparison voltage. The comparison voltage may be anywhere between plus and minus 9.999 volts. If the unknown voltage exceeds 9.999 volts, it must be attenuated. The sequence of events in a measurement procedure is determined by circuitry called the program control.

Measurement begins with polarity determination. First, the comparison voltage is set at zero. The comparator then determines whether the V-input voltage is more (+) or less (-) than zero. Assuming, for explanation purposes, that the unknown voltage is positive, the comparison voltage is then set at +2.000 volts. The comparator then determines whether this is more or less than the attenuated input voltage. If it is greater, the comparison voltage is set at +4.000 volts; if less, the comparison voltage is set at +6.000 volts. The numbers so far have changed only in the left most decade, the thousands decade. Trials continue in this decade as shown in figure 3-2. After four trials, a comparison voltage (V_{1000}) is found which is within one volt less than the attenuated input voltage. This comparison voltage is retained and added to all the trial voltages of the adjacent hundreds decade. Figure 3-2 again applies, except that all numbers must be divided by 10. The first comparison voltage involving the hundreds decade is V_{1000} + 0.200 volts; the next is V_{1000} + 0.400 volts or V_{1000} + 0.600 volts. After four trials in the hundreds decade, a comparison voltage $V_{1000} + V_{100}$ is found which is within 0.1 volt less than the attenuated input voltage. The process continues in a similar fashion with the tens decade and the units decade, resulting in a final comparison voltage equal to $V_{1000} + V_{100} + V_{10} + V_1$. This voltage is within one millivolt of the attenuated input voltage. The polarity and magnitude of the final comparison voltage are displayed in the readout lamps, and are also delivered in digital form to a connector at the rear of the instrument for use with recording devices.

In order to explain the DVM in greater detail this chapter has been divided into the following functional circuit groups:

1. Input attenuator
2. Program control
3. Comparison voltage circuits
4. Comparator circuits
5. Power supplies



4206-2

Figure 3-1. Model 4206 Digital Voltmeter Block Diagram

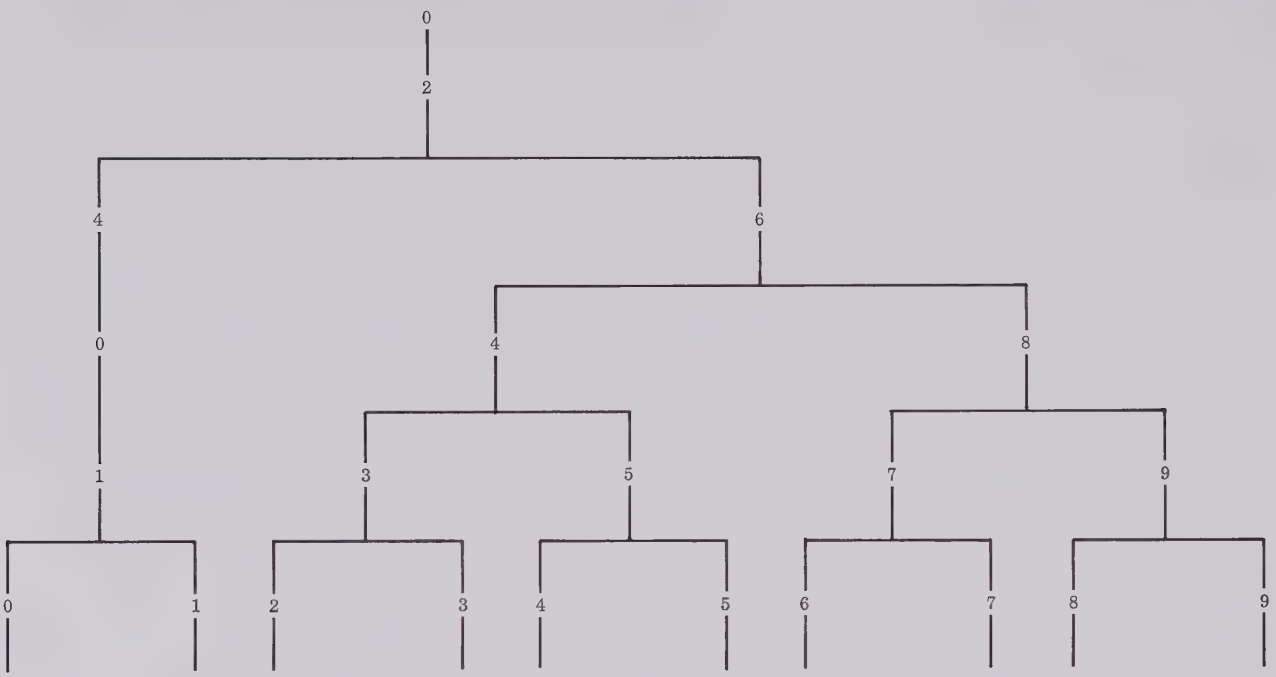


Figure 3-2. Decade Comparison Voltage Sequence

INPUT ATTENUATOR

The input attenuator is used on the 100 volt and 1000 volt ranges to divide the unknown voltage by 10 and 100, respectively. The selection of the proper range may be done manually or automatically. In the autorange mode, the instrument changes to the next highest range when the unknown voltage seen by the comparator exceeds 9.999 volts; the instrument changes to the next lowest range if the unknown voltage, seen by the comparator, is less than 1.000 volts. More will be said about autoranging in the paragraphs on Program Control.

PROGRAM CONTROL

Table 3-1 shows the basic logic circuits used in the instrument. The following logic rules are used:

1. When a given input or output is at the more positive of its two voltage levels, it is said to be "high". "High" is the level for binary zero.

2. When at the less positive of its two voltage levels, the input or output is said to be "low". "Low" is the level for binary one.

The program control determines the sequence of events which occur during a voltage measurement. The entire sequence of events is described in the Program Control Chart on pages 3-5 through 3-7. The time intervals for the program are generated by binary counters numbered one, two, three, and four. Counter one drives counter two, counter two drives three, and three drives counter four. The

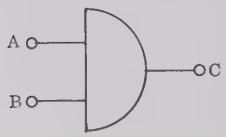
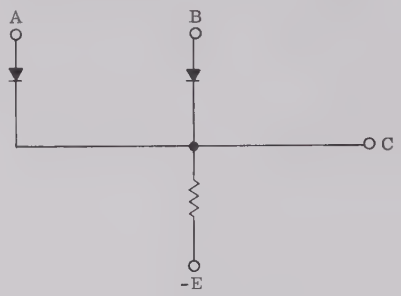
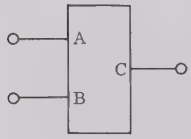
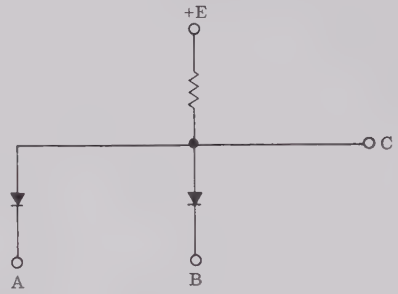
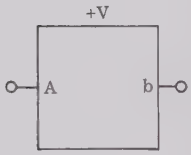
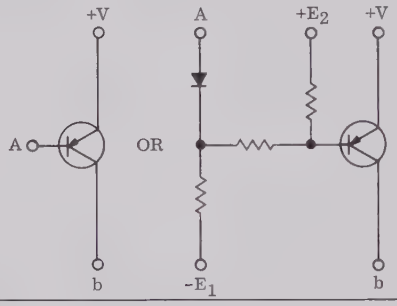
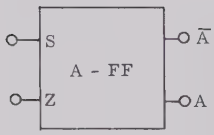
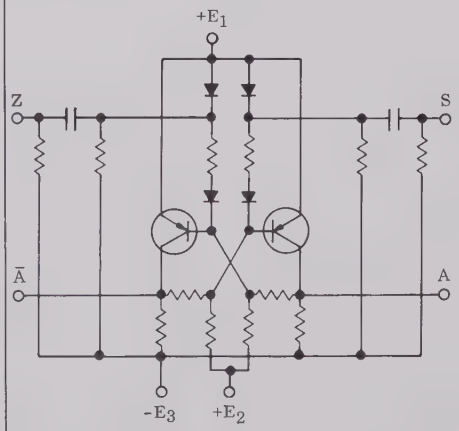
BLOCK DIAGRAM	DESIGNATION	TYPICAL EQUIVALENT CIRCUIT	DESCRIPTION
	AND GATE		C is low only when both A and B are low.
	OR GATE		C is low if either A or B is low.
	INVERTER		b is the inversion of A
	FLIP-FLOP		A negative pulse at S causes A to be low. A negative pulse at Z causes A to be high. The flip flop changes state on the trailing (positive going) edge of the negative pulse.

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Table 3-1. Basic Logic Circuits

Timing Diagram (Figure 3-3) illustrates the waveforms generated by the four counters. Symbols used to define the counter outputs are explained in table 3-2. Additional symbols and corresponding functions are given in table 3-3.

A measurement begins with counter three going through states A3, B3, and C3 while counter four is in state A4. During C3, the DVM completes a measurement of the unknown voltage seen by the comparator. If the correct range is indicated or if the range is controlled manually, the measurement is complete. If the meter is in the autorange mode and an incorrect range is indicated, the meter changes range and makes a second measurement. Counter three repeats the cycle A3, B3, and C3 while counter four is in the state B4. If the range is still incorrect, the process repeats itself a third and final time.

PROGRAM CONTROL CHART

	TIME PERIOD	ACTIONS PERFORMED DURING TIME PERIOD
(1)	D4·D3·A2·A1	The counters remain in this time period indefinitely until a start command is issued or the trigger switch is set to "CONTINUOUS SCAN". The clock multivibrator runs during all time periods and any position of the trigger switch. If a measurement is started externally or by the "SINGLE SCAN" position of the trigger switch, Sync flip-flop S1 is zeroed. The next clock pulse, after the zeroing of S1, sets Sync flip-flop S2. The next clock pulse flips S1 and S2 back to their original states. This action generates pulse S which sets flip-flops a1, a3 and a4. The program counters run through the sequence described below. They stop when they reach the time period D4·D3·A2·A1. If the trigger switch is set to continuous scan, flip-flops a1, a3 and a4 are set and the counters continuously repeat the sequence described below.
(2)	A4·A3·A2·B1 through A4·A3·H2·D1	Correction of the comparison amplifier drift is made by charging capacitor C2 of the Attenuator board. This time is referred to as the restore period. Relays K1 through K5 and transistor switch Q9 of the attenuator board are in their restore positions. Also, during the restore period, the level shift capacitor C1, of the attenuator board, is charged to 10 volts.
(3)	A4·B3	Relays K1 through K5 and transistor switch Q9 of the attenuator board are switched to their operate position. See the amplifier block diagram for details on relay switching. Notice there is a 4 millisecond delay between the energizing of K2 and K5 and the de-energizing of K1, K3 and K4.
(4)	A4·B3·H2·B1·T	All decade flip-flops are zeroed.

	TIME PERIOD	ACTIONS PERFORMED DURING TIME PERIOD	
(5)	A4·B3·H2·D1·T	Decade flip-flop D1000-2 is set. Also, the polarity flip-flop changes state if the down pulse line is low.	
(6)	A4·C3·A2 through A4·C3·D2	Zero lights in 1's and 10's decades are blanked.	
		Decade Flip-Flop Set	Decade Flip-Flop Zeroed if the down pulse line is low
(7)	A4·C3·A2·A1·T	D1000-4	D1000-2
(8)	A4·C3·A2·B1·T	D1000-2* if D1000-2 is set	D1000-4
(9)	A4·C3·A2·C1·T	D1000-1	D1000-2*
(10)	A4·C3·A2·D1·T	D100-2	D1000-1
(11)	A4·C3·B2·A1·T	D100-4	D100-2
(12)	A4·C3·B2·B1·T	D100-2* if D100-2 is set	D100-4
(13)	A4·C3·B2·C1·T	D100-1	D100-2*
(14)	A4·C3·B2·D1·T	D10-2	D100-1
(15)	A4·C3·C2·A1·T	D10-4	D10-2
(16)	A4·C3·C2·B1·T	D10-2* if D10-2 is set	D10-4
(17)	A4·C3·C2·C1·T	D10-1	D10-2*
(18)	A4·C3·C2·D1·T	D1-2	D10-1
(19)	A4·C3·D2·A1·T	D1-4	D1-2
(20)	A4·C3·D2·B1·T	D1-2* if D1-2 is set	D1-4
(21)	A4·C3·D2·C1·T	D1-1	D1-2*
(22)	A4·C3·D2·D1·T		D1-1

PROGRAM CONTROL CHART (CONT)

TIME PERIOD		ACTIONS PERFORMED DURING TIME PERIOD
(23)	A4·C3·E2·T and A4·C3·F2·T	If no range change is required, set the Record flip-flop
(24)	A4·C3·H2·T	If the Record flip-flop is not set at period (23): (A) The range flip-flops change state; causing the meter to uprange or downrange, as required, to an adjacent range. (B) The program counters flip to the state B4·A3·A2·A1. (C) The sequence from period (2) to (24) is repeated where A4 is replaced by B4. If the Record flip-flop is set: (A) If the trigger switch is not at "continuous scan", the program counters flip to period (1) which ends the measurement cycle. (B) If the trigger switch is at "continuous scan", the program counters flip to A4·A3·A2·A1 and the sequence from period (2) to (24) is repeated.
(25)	B4·C3·H2	The actions performed are the same as described for period (24) with B4 replaced by C4.
(26)	C4·C3·H2	If the trigger mode is not "continuous scan", the program counters flip to period (1) which ends the measurement cycle. If the trigger mode is "continuous scan", the program counters flip to A4·A3·A2·A1 and then repeat the sequence beginning with period (2).

The outputs of counter flip-flops are denoted by lower case letters followed by a number which indicates to which counter the flip-flop belongs.

Counter 1	Counter 2	Counter 3	Counter 4
a1	a2	a3	a4
b1	b2	b3	b4
	g2		

The states of each counter are denoted by upper case letters and numbers indicating the appropriate counter.

Counter 1	Counter 2	Counter 3	Counter 4
A1	A2	A3	A4
B1	B2	B3	B4
C1	C2	C3	C4

Table 3-2. Counter Symbols

Counter 1	Counter 2	Counter 3	Counter 4
D1	D2 E2 F2 G2 H2	D3	D4

Logic Rules: "O" = High
"I" = Low

Table 3-2. Counter Symbols (Continued)

SYMBOL	FUNCTION
e1	Down-Range condition
e2 & e3	Up-Range Condition
e	$\overline{e1} \cdot \overline{e3}$, correct range
E	External Trigger position of trigger switch
F	$a4 \cdot b4 + \overline{e1} \cdot \overline{e3}$, scan operation to be terminated
$\overline{G}$	Manual Range Condition
M	Down Pulse
N	Continuous scan position of trigger switch
R	Storage of F, and Record flip-flop
S	Start Signal
U	Single Scan position of trigger switch
W	Standby position of trigger switch
D1000-0	Thousands decade, Decimal Zero
D1000-9	Thousands decade, Decimal Nine
D1000-2	Thousands decade, Binary Two
D1000-4	Thousands decade, Binary Four
D1000-2*	Thousands decade, Binary Two*
D1000-1	Thousands decade, Binary One

Table 3-3. Symbols and Their Function

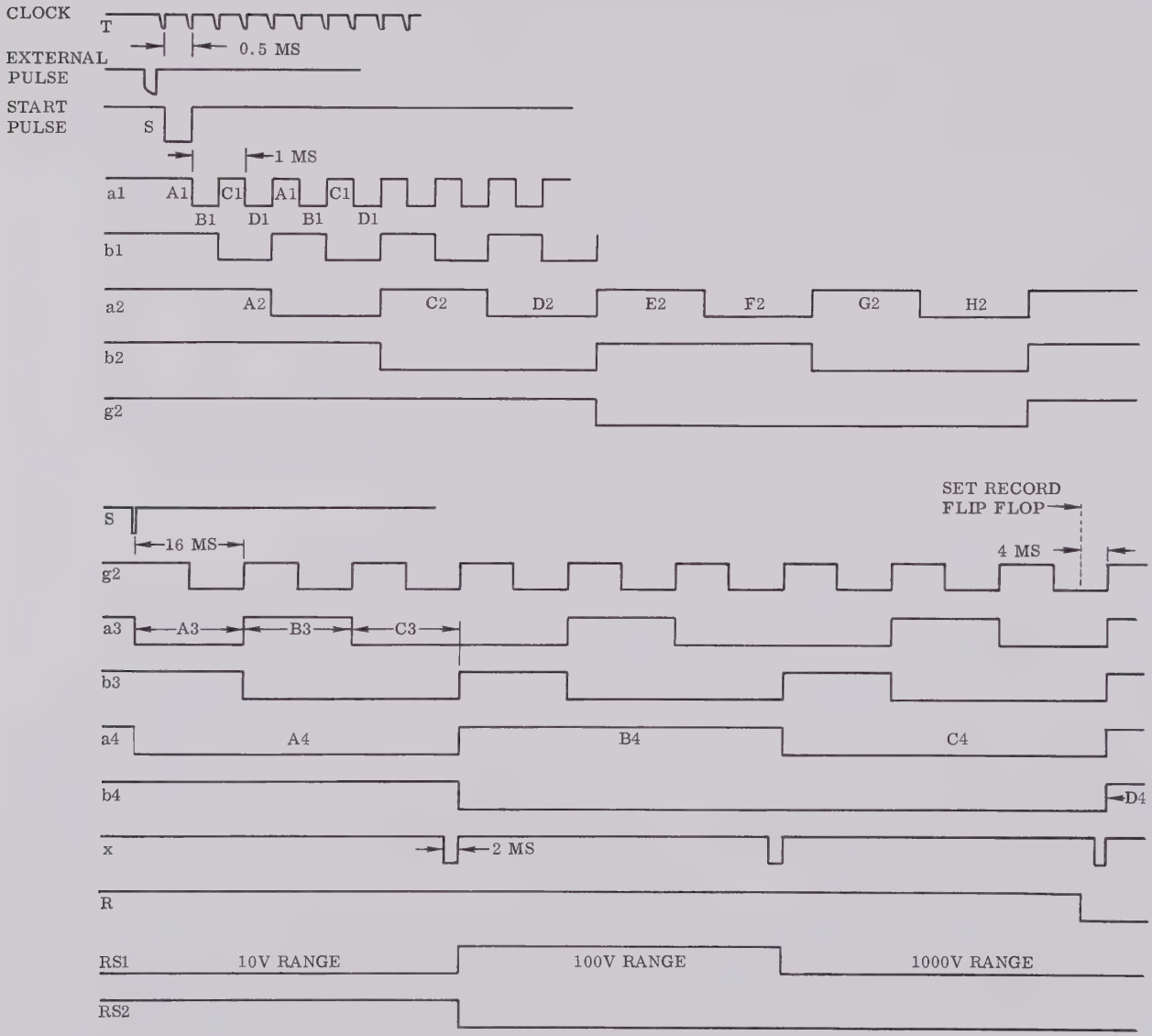

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Figure 3-3. Timing Diagram

AUTORANGING

The three ranges of the instrument are controlled by range flip-flops RS1 and RS2 located on the Range Logic board. The decision to change range is controlled by the Record flip-flop located on the Power Supply board. The time of the decision is determined by the function $C3 \cdot g2 \cdot \overline{b2} \cdot T$. This function is generated by "And" gate 17 shown on the block diagram of the Sync, Polarity FF's. (Drawing 42-89, Sheet 3).

Range	RS2	RS1
----	0	0
10V	0	1
100V	1	0
1000V	1	1

Table 3-4. Range Flip-Flops Truth Table

The instrument upranges by one range when the unknown voltage seen by the comparator exceeds 9.999 volts. This condition is indicated when $\overline{e3}$ is high. (See the Range Logic Block Diagram, 42-22, Sheet 3.)

The instrument downranges by one range if the unknown voltage seen by the comparator is less than 1.000 volts, and if the instrument is not already in the lowest range. This condition is indicated when $\overline{e1}$ is high. A further condition for range changing is that only two changes may be made during one voltage measurement. This is accomplished with counter four which stops the program after two range changes. The three conditions given above determine function F (See Range Logic Block Diagram) which controls the Record Flip-Flop which, in turn, controls the range flip-flops and counters three and four.

The time when the range flip-flops may change state is determined by the function X which is generated by gate 13 shown on the Range Logic Block Diagram.

A simplified block diagram of the autoranging circuits is shown in figure 3-4.

COMPARISON VOLTAGE CIRCUITS

The comparison voltage circuits provide the standard, or comparison, voltage against which the attenuated input voltage is compared. They consist of:

1. Digital storage in the form of 17 flip-flops which drive

2. A highly precise digital-to-analog converter, the output of which is shifted positive by approximately 10 volts by

3. A level shift circuit, the output of which is the comparison voltage.

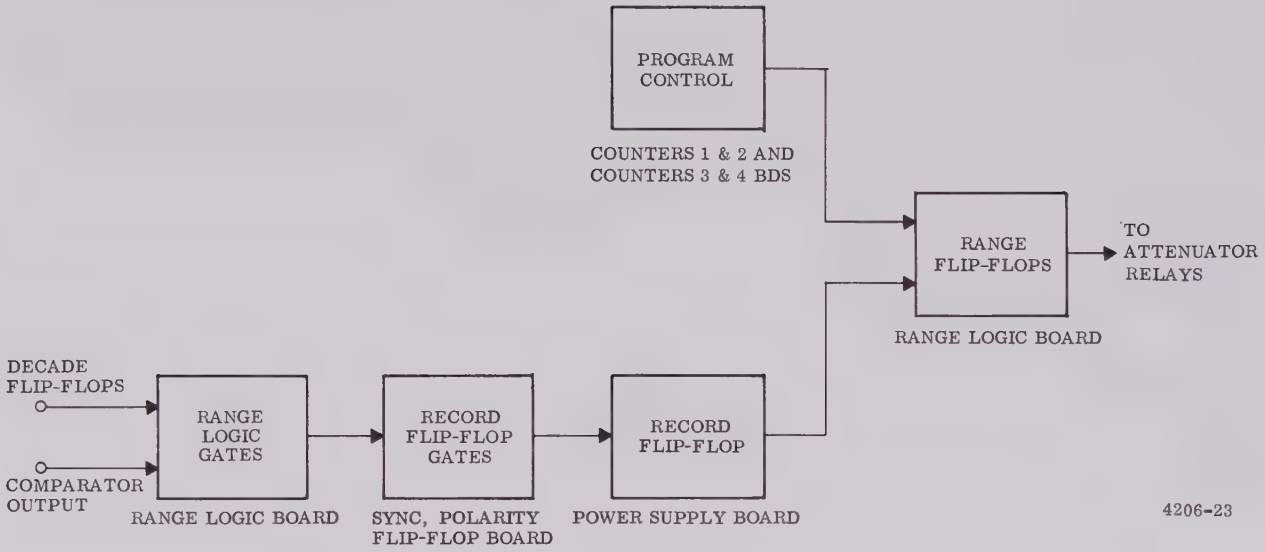


Figure 3-4. Simplified Block Diagram of Autoranging Circuits

A simplified block diagram of the comparison voltage circuits is shown in figure 3-5. The creation of the comparison voltage begins with four sets of four flip-flops representing a four digit number. Each set represents one of the four decades, the units, tens, hundreds, and thousands decades. The four flip-flops of a decade can store any decimal digit from 0 to 9, in the 2-4-2*-1 binary-coded-decimal system. Table 3-5 shows the binary code used in the Model 4206 DVM.

2	4	2*	1	Decimal Number
0	0	0	0	0
0	0	0	1	1
1	0	0	0	2
1	0	0	1	3
1	0	1	0	4
1	0	1	1	5
1	1	0	0	6
1	1	0	1	7
1	1	1	0	8
1	1	1	1	9

Table 3-5. Binary Code Used in Model 4206 DVM

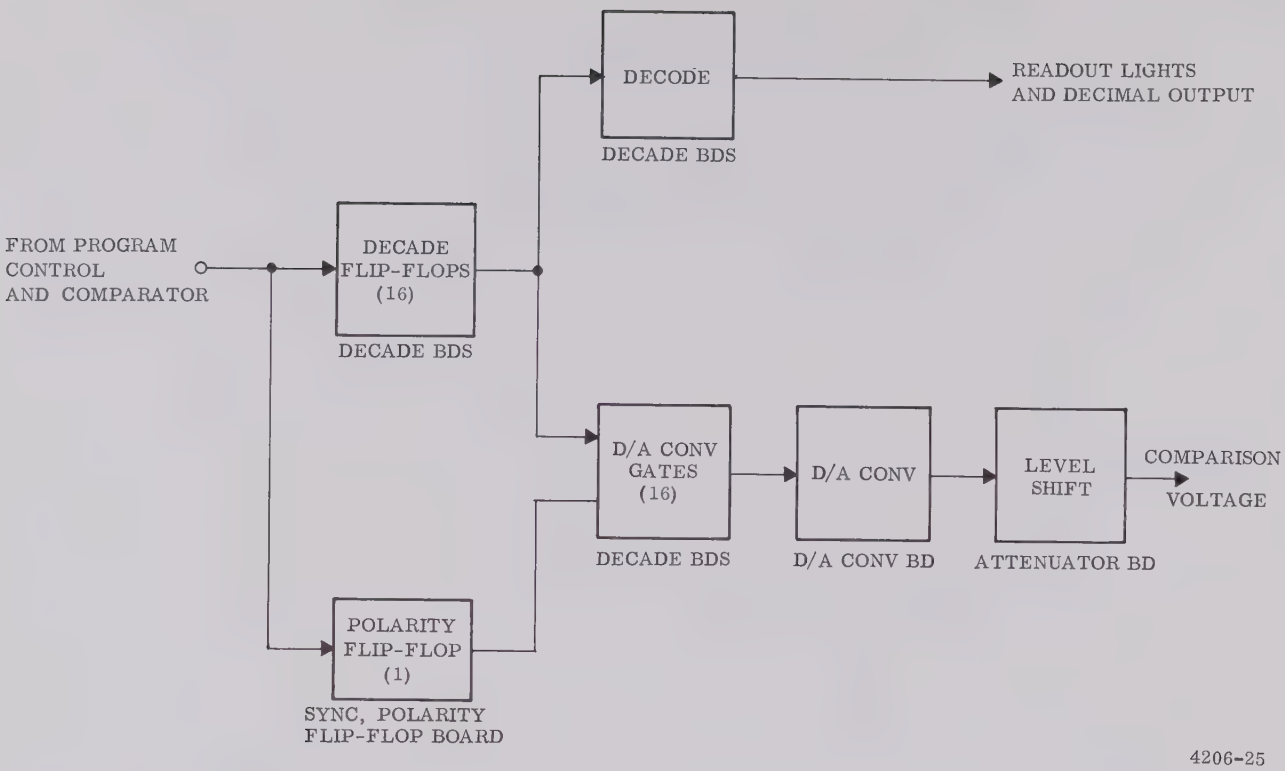


Figure 3-5. Block Diagram of Comparison Voltage Circuits

One of two outputs of each decade flip-flops controls a switch in the digital-to-analog converter. The controlling output is determined by the polarity flip-flop which stores the polarity of the voltage being measured. Figure 3-6 illustrates this for one binary digit of one decade.

The states of the 16 decade flip-flops and the polarity flip-flops are determined by the program control and the comparator. The entire operation for one measurement is described in the Program Control Chart. Drawing 42-190 shows a block diagram of the input circuits which control the decade flip-flops. The symbol M represents the down pulse line which is the comparator output located on the Amplifier board. All the inputs shown in drawing 42-190 are derived from the program control circuits located on three plug-in boards, Counters 1 & 2, Counters 3 & 4, and the Sync., Polarity flip-flops.

The digital-to-analog converter consists of transistor switches and resistors making a voltage divider whose output may be at any of 20,000 discrete voltage levels between -20 V and 0 V.

The level shift circuit adds a constant voltage of ten volts, plus a minus two millivolts, to the output of the digital-to-analog converter. This is accomplished by a "flying capacitor", C1, on the attenuator board. The charge on the capacitor is replenished during each measurement through a voltage divider. The polarity balance adjustment (Refer to Chapter IV, Calibration.) is made by controlling the output of this voltage divider.

In addition to providing drivers for the digital-to-analog converter, the decade flip-flop outputs deliver the comparison voltage in digital form to the readout display and to the DVM output. Decode circuits, shown in the block diagram in figure 3-5 convert the decade flip-flop outputs from binary coded decimal to decimal form.

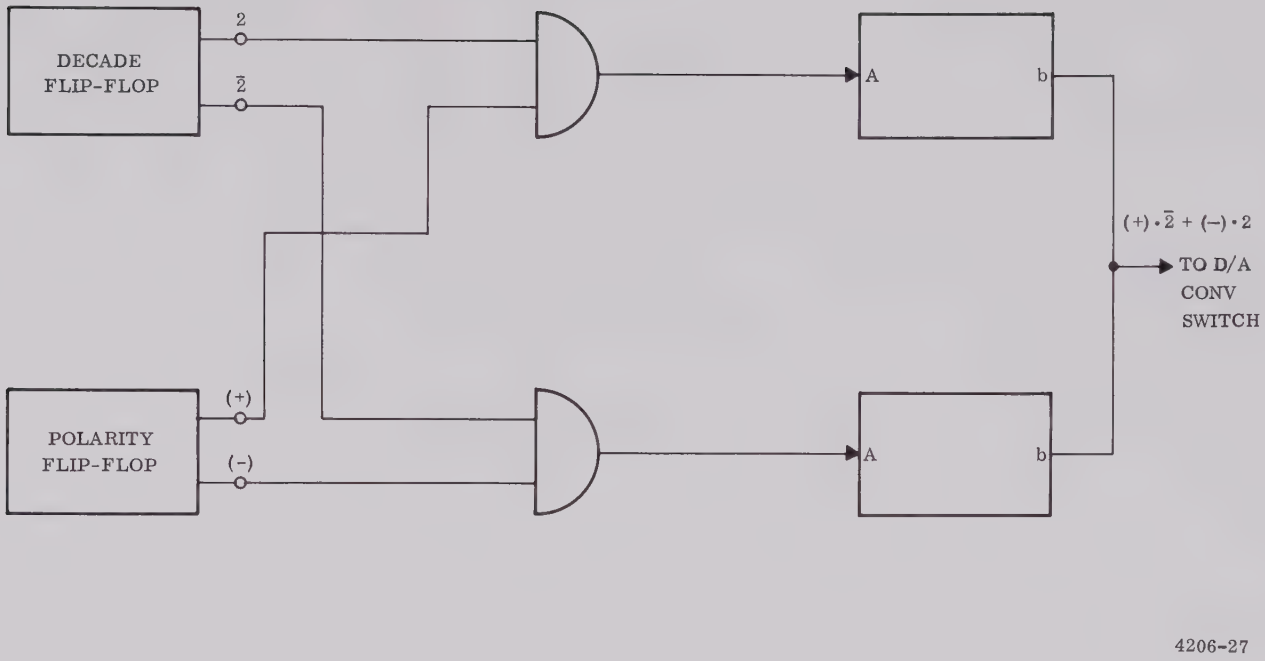


Figure 3-6. Flip-Flops and Digital-To-Analog Converter Gates

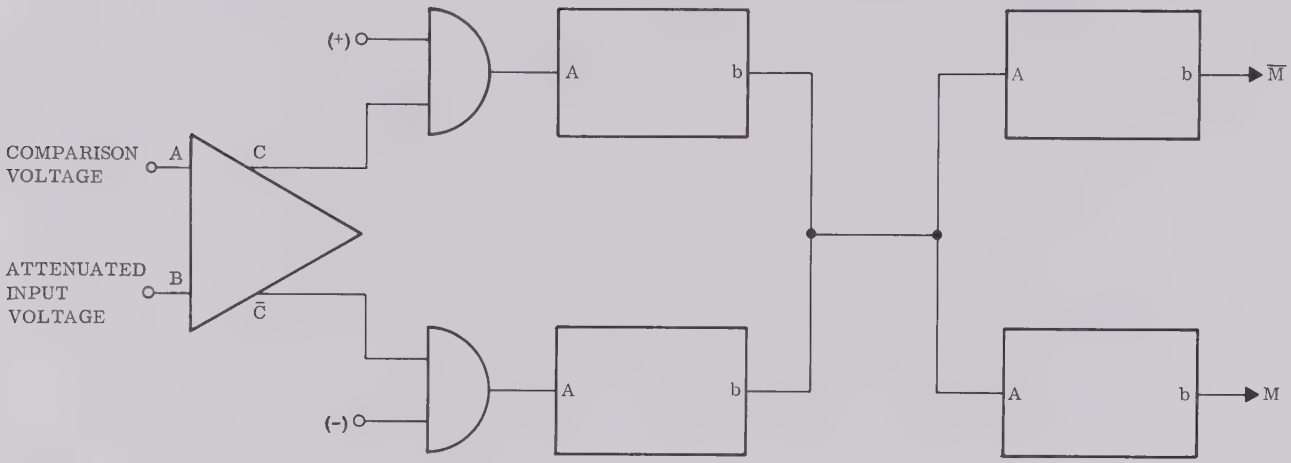
COMPARATOR CIRCUITS

The comparator consists of the comparison amplifier and the exclusive or circuit which are located on the Amplifier & Relay Drivers board and the Attenuator board. Its purpose is to determine whether the magnitude of the comparison voltage is more or less than the attenuated input voltage. The comparison amplifier first determines which of the two voltages is more positive. Then the exclusive or circuit combines this information with the polarity of the two voltages to give the desired magnitude comparison, M. M is the comparator output, also called the down pulse line. Figure 3-7 shows a block diagram of the comparator circuits and Table 3-6 shows the amplifier and comparator outputs for the different input conditions.

The attenuated input voltage point is located at grid pin 2 of the tube VI of the Attenuator board. The comparison voltage point is at grid 7 of the same tube. The amplifier output C of figure 3-7 is located at the collector of Q10 of the Amplifier board. Other points of interest are labeled on the Amplifier schematic (Drawing No. 42-92).

POWER SUPPLIES

With the exception of the -20 volt precision supply, all the power supplies are located on the power supply board. The +24 volt supply on this board is regulated, using the -20 V for a reference. All other supplies on the board are unregulated. The DC voltages, tolerances, and line frequency ripple specifications are given on the power supply schematic.



NOTE: C is low when the input voltage is more positive than the comparison voltage.

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Figure 3-7. Comparator Circuits

Attenuated signal input voltage with respect to the comparison voltage	Amplifier output at C	Polarity sign of input	Comparator output at M
+	Low	+	High
+	Low	-	Low
-	High	+	High
-	High	-	Low

Table 3-6. Comparator Input-Output Relationships

The -20-volt precision supply is a high stable, accurate, low impedance voltage source for the comparison voltage circuits. This supply is located on the Digital-to-Analog converter board. The specifications for this supply are:

1. D. C. level is 19.999 volts ± 0.001 volts.
2. Line frequency ripple is less than 200 μv,
3. Level shift during a measurement is less than 1 MV.
4. Voltage spike fall time during a measurement is less than 50μsec.

CHAPTER IV

CALIBRATION

When a 4206 Digital Voltmeter is not making readings within specifications, it is time for calibration, repair, or both. In the calibration information provided in this chapter, it is assumed that the instrument is in good working order and only requires calibration. If any components are defective, it may be difficult, if not impossible, to calibrate the instrument properly.

The calibration procedure is divided into three distinct areas: absolute accuracy and adjustment, polarity balance and adjustment, and range adjustments. It is important to adjust the instrument by following the steps in their numbered sequence. Refer to figure 4-1 to determine the locations of all adjustment potentiometers.

EQUIPMENT REQUIRED

1. Stable sources of 9.500 - 9.999, 95.00 - 99.99, and 950.0 - 999.9 volts DC. It is not necessary that the precise values of these voltages be known; the only requirement is that they fall within the specified range and are stable.

2. A ratio box with precise divisions of 10:1 and 100:1, such as the NLS 3020.

3. A bank of nine standard cells, such as the NLS 3006, which provides 9.16XX volts.

CALIBRATION STEPS

ABSOLUTE ACCURACY ADJUSTMENT

1. Turn the instrument on and allow it to warm up for a period of 30 minutes.

2. Set the RANGE switch at AUTO, the TRIGGER switch to CON. SCAN.

3. Connect the standard-cell bank (Item 3 under Equipment Required) to the input of the instrument; See figure 4-2 for cable connections.

4. The display should read correctly the certified value of the standard-cell bank. If it does not, adjust R23 until the display reads the correct value. When adjustment is made remove the standard-cell bank from the instrument leads.

POLARITY BALANCE ADJUSTMENT

5. Connect a stable source of 9.500 - 9.999 to the input of the instrument (Item 1 under Equipment Required). Note the value indicated on the display.

6. Reverse the polarity of the input applied in Step 5 and observe that the value is exactly the same, but in the opposite polarity. If the digits displayed in Step 5 are not the same as in this step, adjust R-64 until the readings agree in both polarities. Adjustment may be made while the display reads in either polarity.

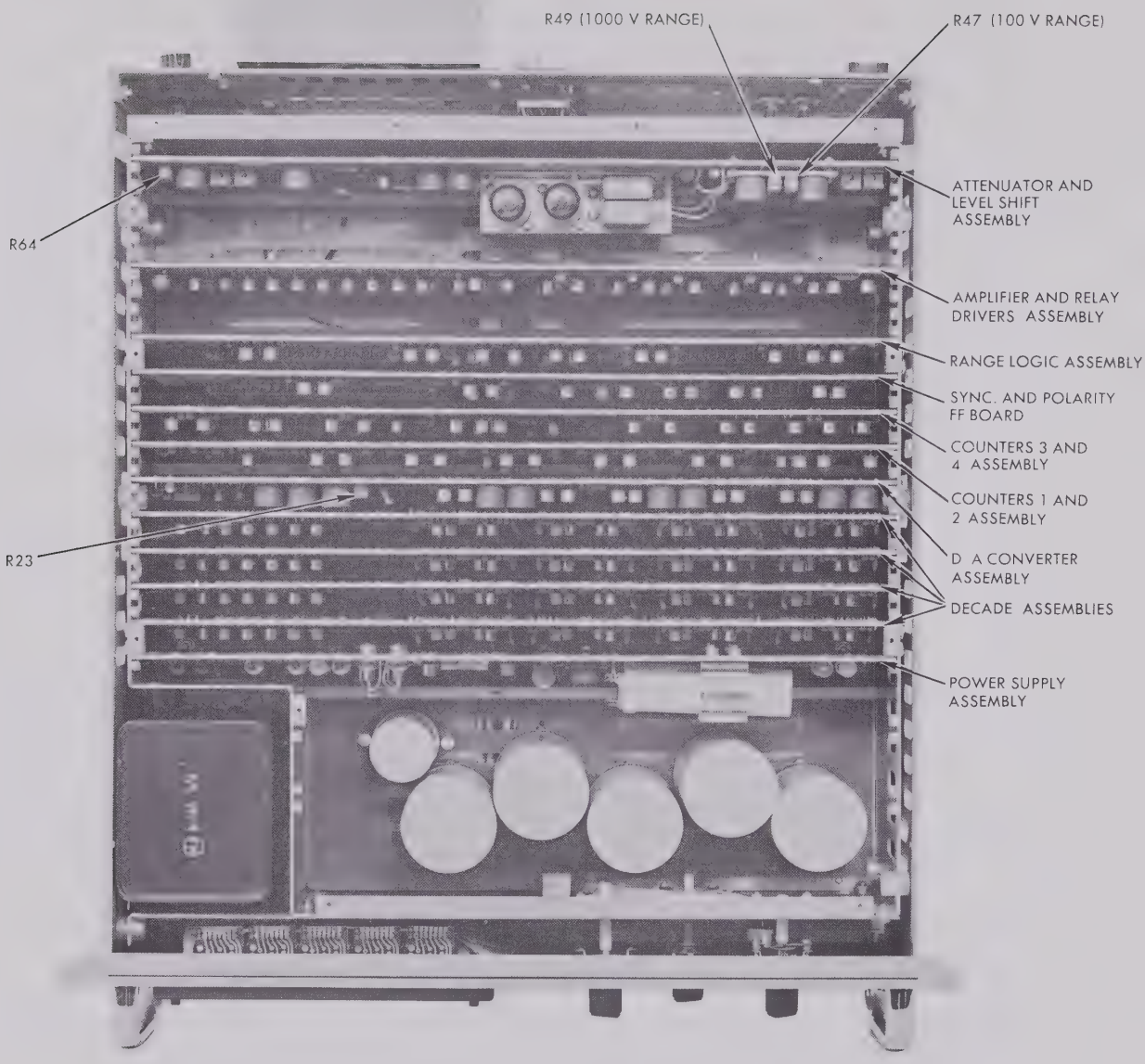


Figure 4-1. Top View of Model 4206 Digital Voltmeter Showing Adjustments and Board Locations

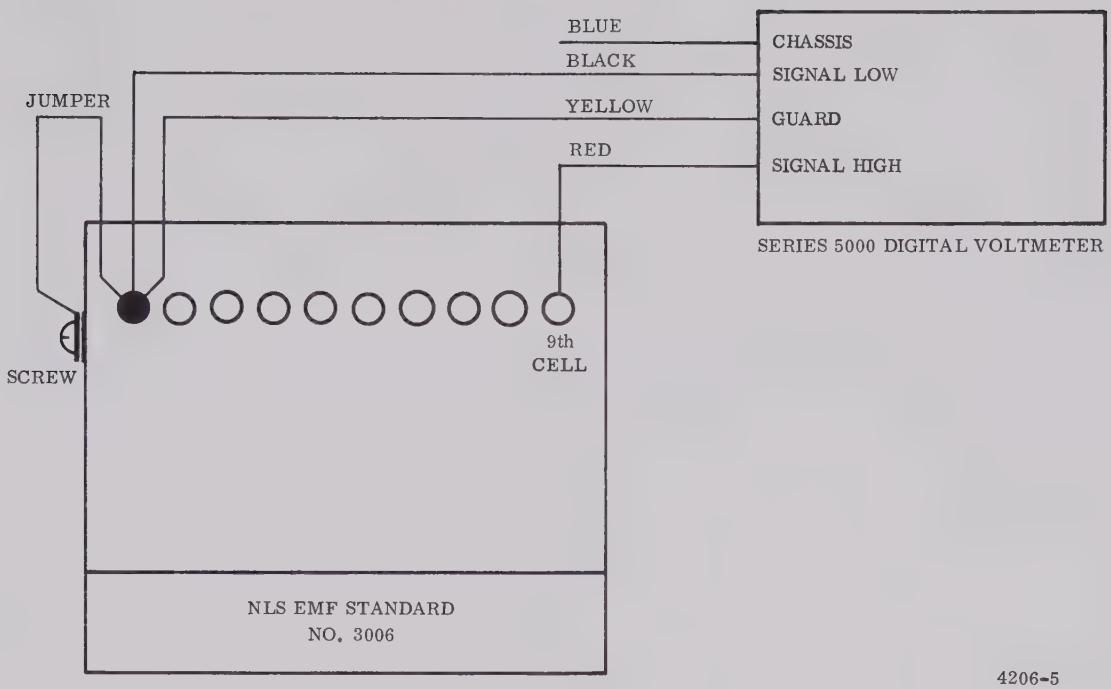


Figure 4-2. Cable Connections

7. Since there is interaction between the adjustment of R-64 and R-23, repeat Steps 3, 4, 5, and, if necessary, Step 7.

RANGING ADJUSTMENT (100 Volts)

8. Connect the input terminals of the digital voltmeter to the output of the ratio box (Item 2 under Equipment Required).

9. Set the ratio box at 10:1 and apply a stable source of 95 - 99 volts to its input. Record the value display.

10. Remove the input leads of the voltmeter from the output of the ratio box and connect them to the input. Record the value of the display.

11. If the readings taken in Steps 9 and 10 are the same, except for decimal-point position, the 100-volt range is correctly adjusted. For example, if the reading in Step 9 was 98.76, then the reading in Step 10 should be 9.876. If the readings are not correct, adjust the 100-volt danger potentiometer, R-47.

WARNING

Use extreme caution in performing the following steps as dangerously high voltages will be employed.

RANGING ADJUSTMENT (1000 Volts)

12. Connect the input terminals of the digital voltmeter to the output of the ratio box.

13. Set the ratio box at 100:1 and apply a stable source of 950 to 999 volts to its input. Record the value of the display.

14. Remove the input leads of the voltmeter from the output of the ratio box and connect them to the input of the ratio box. Record the value of the display.

15. If the readings taken in Steps 13 and 14 are the same, except for decimal-point position, the 1000-volt range is correctly adjusted. For example, if the reading taken in Step 13 was 9.876, then the reading in Step 14 should be 987.6. If the readings are not correct, adjust the 1000-volt range potentiometer, R-49.

CHAPTER V

MAINTENANCE

If a 4200 Series Digital Voltmeter is not working properly, or if it cannot be calibrated according to instructions, service will be required.

Before seeking out specific defective components, it is best to establish that the several power supplies are working. Specifically, voltage checks should be made at the voltage output points of the power supplies as indicated on the schematic drawings. A simple 20,000 ohm-per-volt d'Arsonval type meter may be used for these measurements. The voltage measurements should indicate correct values ±15% when read on a voltmeter with a rated accuracy of ±3%. The outputs of the regulated power supplies cannot be accurately read by this method, but in practice the accuracy of their outputs need not be known; if a regulated power supply fails, it is most likely that the voltage error will be gross (or there will be no output at all) and therefore detectable with simple measuring instruments.

If a measured voltage appears to be at an improper value, the associated power supply components should be checked; if none of these are found to be defective, it will be necessary to proceed along the defective power path, checking wiring, connectors, printed circuitry, and finally components on the boards. An obvious way to make a speedy check is to replace suspected defective boards with known good ones. Since the decade boards are all interchangeable, a malfunction affecting one decade of the readout can be made to affect other decades. For this reason, it is suggested that a trial and error approach be used and the decade boards be interchanged. If the malfunction then manifests itself in a previously unaffected decade, the defective board can be readily isolated. From this point on, a test of components will locate the precise area of failure.

It is suggested that the block diagrams in this manual first be consulted, and then the individual schematics be studied so as to better know what outputs may be expected at each function.

When testing for the presence of an output, bear in mind that there are timing relationships and that if an expected output is missing, the instrument's flip-flops may be in a state which nulls a particular value which is being sought.

Table 5-1 lists specific types of malfunction. Note that any of dozens of components could fail and yet the symptom would be the same for all, there is no one component which can readily be singled out as a consistent offender. For this reason, the most useful approach to trouble-shooting is to provide a list of possible types of failure and identify the plug-in board or circuit area most likely to contain the defective component.

SYMPTOM	PROBABLE DEFECTIVE BOARD
Readout locks on 9 in a given decade	D/A Conveter
Polarity lights are out or are incorrect.	Sync, Polarity FF

Table 5-1. Troubleshooting

SYMPTOM	PROBABLE DEFECTIVE BOARD
Decimal lights are out or are incorrect.	D/A Converter
Multiple lights appear in one or more decades.	Sync, Polarity FF Counters 1 & 2 Decade
A particular digit fails to illuminate.	Bulbs Decade
Readout illuminates, but instrument does not scan.	Counters 1 & 2 Sync, Polarity FF Power Supply Counters 3 & 4 Range Logic
Readout is locked at 9999, or is unstable and seeks 9999 regardless of input voltage.	Amplifier Counters 3 & 4 -20V Precision Supply
Readout displays 9999 in one polarity, but not in other, regardless of input voltage	Sync, Polarity FF Amplifier Attenuator
Instrument scans when MODE switch is at STAND-BY	Counters 3 & 4 Sync, Polarity FF
Instrument skips digits, or has "holes" in decades. Transfers and linearity are poor.	D/A Converter Counters 1 & 2 Decade
Readout shows only certain numbers in decades.	Decade D/A Converter
Instrument reads correctly in one polarity, but loses digits in the other.	D/A Converter
Readout illumination is dim.	-20v Precision Supply
Readout displays erroneous values which are somewhat proportional to the input voltage.	Voltage Reference Supply Input Attenuator D/A Converter
Readout "sticks" on particular numbers.	Decade

Table 5-1. Troubleshooting (Continued)

DIGITAL READOUT MAINTENANCE

The digital readout assembly (Figure 5-1) does not ordinarily require maintenance other than lamp bulb replacement and an occasional cleaning. Most readouts have decals on the readout cover, on the top and bottom of each readout, to show which contact is providing the signal for each digit or symbol. If decals are not provided, see figure 5-2 for information to locate each digit or symbol contact point.

Lamp Bulb Replacement

When it is determined that a digit or symbol is not illuminating within a specific readout display, the lamp bulb may be replaced by performing the following steps:

1. Remove the four Allen-head screws attaching the bezel to the DVM chassis. The readout assembly may now be withdrawn from the instrument.

2. Locate the correct contact point for the defective bulb either by noting the decal on the specific readout or by referring to figure 5-2.

3. Remove the lamp board assembly (top or bottom) from the readout containing the defective bulb by removing the two attaching screws.

4. Gently withdraw the lamp board assembly away from the lamp block within the readout cover.

5. Unsolder defective bulb and replace it with a functioning T1-3/4 14-volt bulb.

6. Reassemble readout and readout assembly in reverse order of disassembly.

Readout Window Cleaning

Under extremely adverse dust or humidity conditions, the individual readout windows may require cleaning. If accumulated dust particles are likely to be unusually abrasive, a camel-hair brush or artist's sable brush should first be used to remove loose dust particles. The windows may then be cleaned with commercial isopropyl alcohol and lint-free paper, such as Kimwipes 900-L, manufactured by Kimberly-Clark, Neenah, Wisconsin. The windows may also be cleaned if they are dipped in alcohol and then blown dry with compressed air.

To remove the windows from the readout, perform the following steps:

1. Perform Step No. 1 under Lamp Bulb Replacement.

2. Remove readout retaining bar by removing two attaching screws.

3. Perform Step No.'s 3 and 4 (both top and bottom lamp boards) under Lamp Bulb Replacement for each readout to be cleaned.

4. Remove each two sets of lamp block attaching screws.

5. Gently press against one lamp block until the other lamp block may be removed and until windows can be withdrawn with finger-tip pressure.

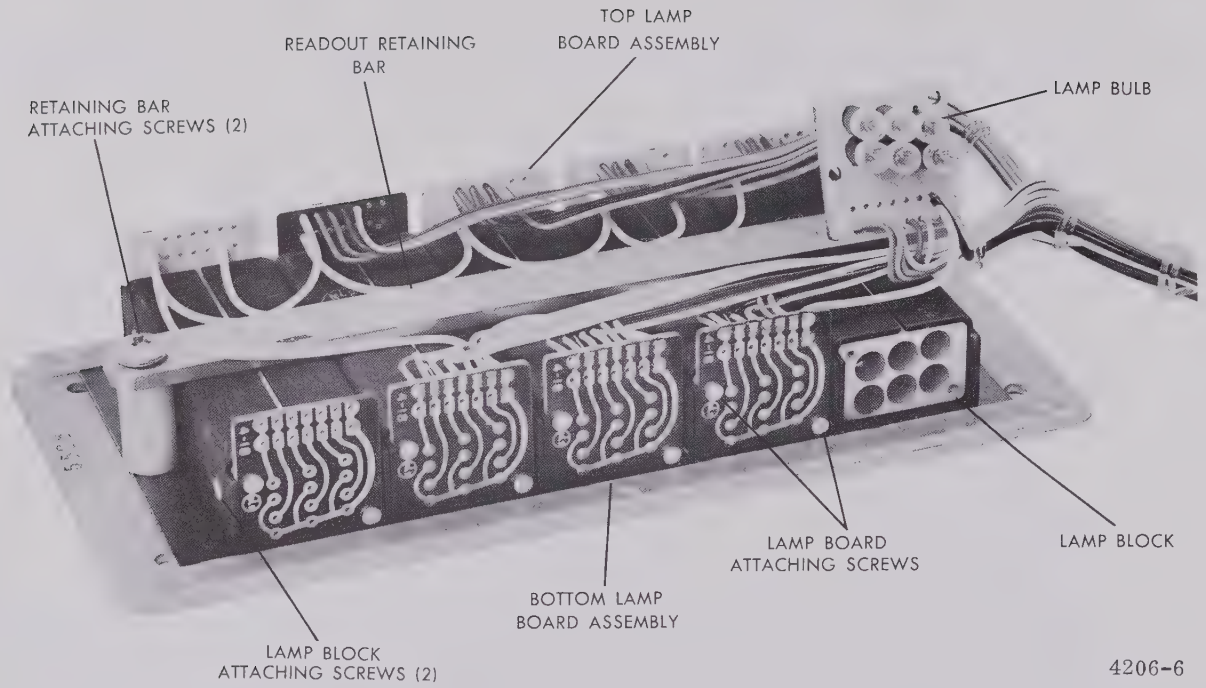


Figure 5-1. Readout Assembly

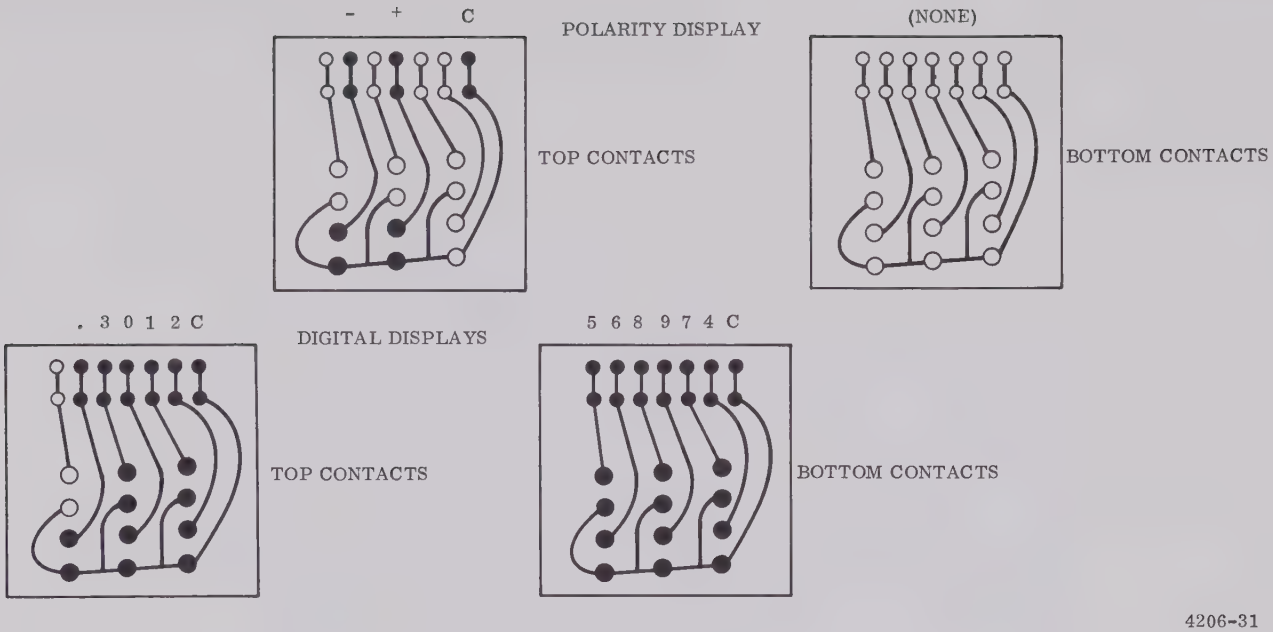


Figure 5-2. Lamp Bulb Contact Points

6. Clean the windows as set forth above.

NOTE

It is well to be systematic about this operation so as to avoid replacing the windows in improper order. Care should be taken to avoid replacing the windows backwards; this type of error is most likely to occur with windows marked 1, 0, 6, 8, 9, -, or +. Note that the engraved side always faces to the rear of the readout.

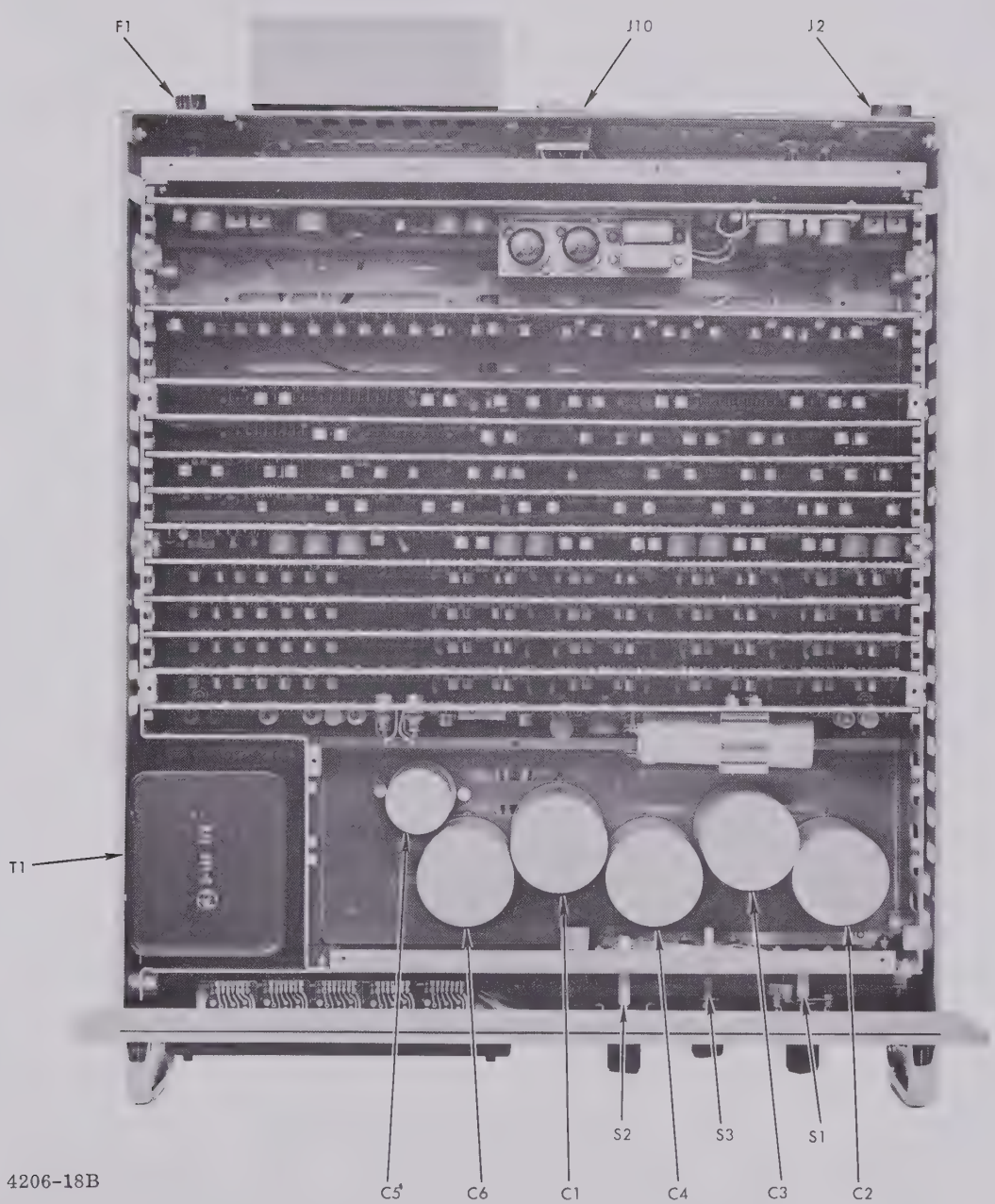
7. Stack the windows in proper order and press them together with mild finger-tip pressure. Avoid fingerprints on the windows. After ensuring that the numerals are right side up and that the engraved side faces the rear of the readout, gently slip the windows into the cover.

8. Reassemble readout and readout assembly in reverse order of disassembly.

If the readout contains a Polaroid filter in front of the display, it may be removed and cleaned in the same manner as the readout windows. Care should be taken to re-install the filter so that the polarizing action is correct. Look through the filter at a piece of shiny metal, such as the chrome rim of a wrist-watch. If the metal shows a markedly violet cast, then the filter front is the surface closest to the eye.

CHAPTER VI

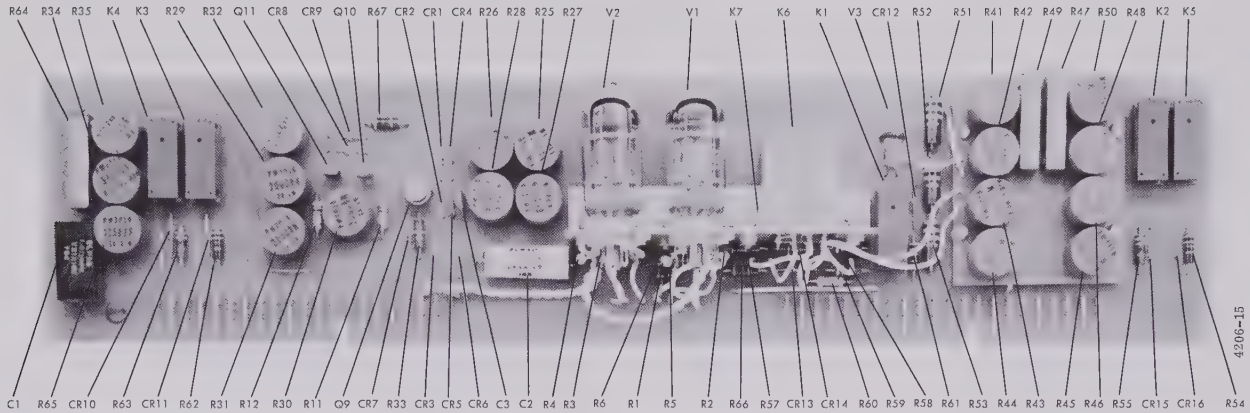
PARTS LIST



Digital Voltmeter, Model 4206 (Top View)

Digital Voltmeter, Model 4206 (Top View)

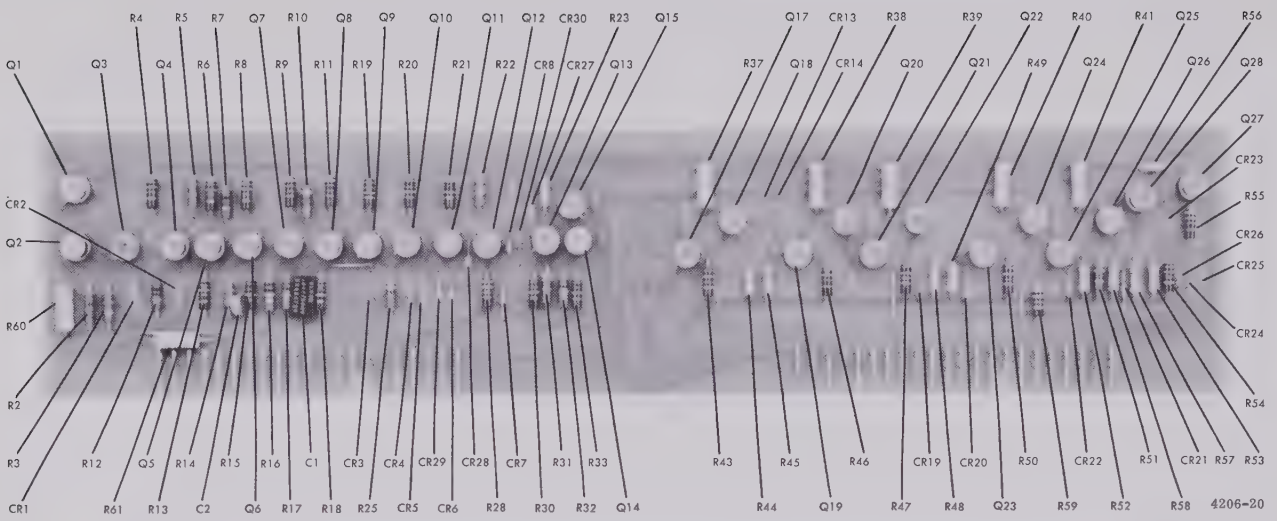
CIRCUIT REFERENCE	PART NO	DESCRIPTION	QTY PER ASSY	MANUFACTURER
F1	313001	FUSE - 3AG1A, SLO-BLO	1	Littlefuse, Inc.
J2	9.7-3102A-14S-2P-426	CONNECTOR, INPUT	1	Amphenol
J10	201996-1	CONNECTOR		Amphenol
S1	42-32	SWITCH, POWER	1	NLS
S2	42-30	SWITCH, RANGE	1	NLS
S3	42-31	SWITCH, TRIGGER	1	NLS
T1	3-8	TRANSFORMER	1	NLS
C1, C4 & C6	1B1246-RRK	CAPACITOR, 4000 VF, 25 V	3	Industrial Condenser
C2 & C3	1B1245-RRK	CAPACITOR, 2000 VF, 50V	2	Industrial Condenser
C5	05RTPK-500	CAPACITOR, 500 VF, 25 V	1	Industrial Condenser



Attenuator Assy., 42-95

CIRCUIT REFERENCE	PART NO.	DESCRIPTION	QTY PER ASSY	MANUFACTURER
C1	VX1X105	CAPACITOR, 1.0 MFD, 100V	1	Elpac, Inc.
C2	ZX2A105	CAPACITOR, 1.0 MFD, 200V	1	Elpac, Inc.
C3	DD102	CAPACITOR, 0.001 MFD, 1000 V, 10%	1	Centralab
CR1 thru CR16	5003-002	DIODE	16	NLS
K1 thru K5	5-0-1	RELAY, REED	5	NLS
K6 & K7	BR7Y900-A8	RELAY	2	BABCOCK
Q9	2N1305	TRANSISTOR	1	Texas Instruments
Q10 & Q11	2N3711	TRANSISTOR	2	Texas Instruments
R1 thru R4	Com'l	RESISTOR, 1K, 1/2W, 5% (Carbon)	4	
R5 & R6	Com'l	RESISTOR, 6.8K, 1/2W, 5% (Carbon)	2	
R11 & R12	Com'l	RESISTOR, 20K, 1/2W, 5% (Carbon)	2	
R25 & R26	PW2016	RESISTOR, 15K, 1/2W, 0.1%	2	NLS
R27 & R28	PW2016	RESISTOR, 6.8K, 1/2W, 0.1%	2	NLS
R29 thru R31	PW2016	RESISTOR, 2K, 1/2W, 0.1%	3	NLS
R32	PW2016	RESISTOR, 2.8K, 1/2W, 0.1%	1	NLS
R33	Com'l	RESISTOR, 12K, 1/2W, 5% (Carbon)	1	
R34	PW2016	RESISTOR, 5.192K, 1/2W, 0.03%	1	NLS
R35	PW2016	RESISTOR, 5K, 1/2W, 0.03%	1	NLS

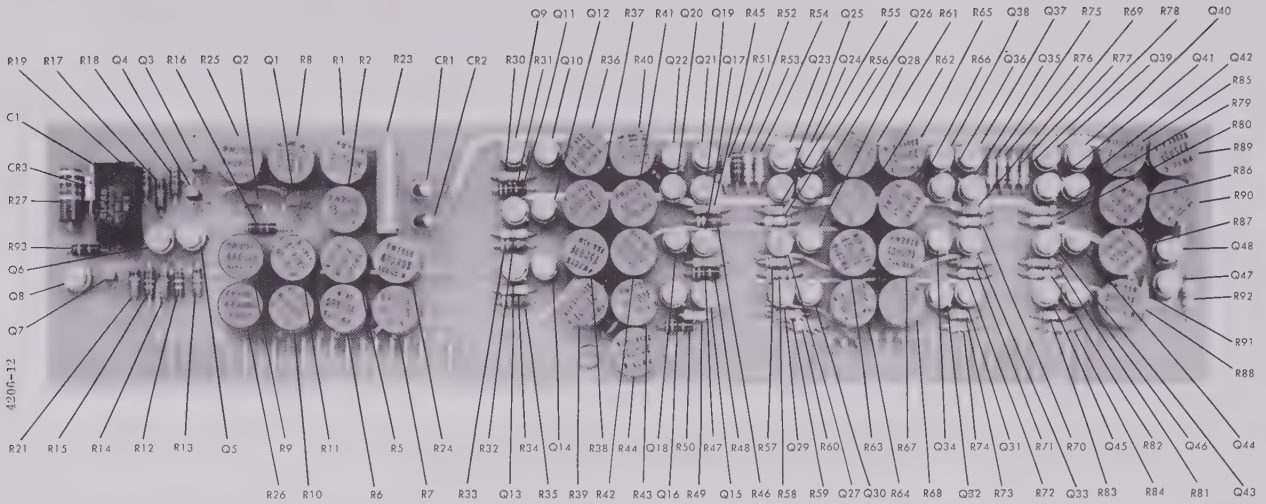
CIRCUIT REFERENCE	PART NO.	DESCRIPTION	QTY PER ASSY	MANUFACTURER
R41 thru R46	PW2016	RESISTOR, 1.5 megohms, 1/2W, 0.05%	6	NLS
R47 & R64	200P-1-203	POTENTIOMETER, 20K, 1/2W, 5% (Wire Wound)	2	BOURNS
R48	PW2016	RESISTOR, 890K, 1/2W, 5%	1	NLS
R49	200P-1-202	POTENTIOMETER, 2K, 1/2W, 5% (Wire Wound)	1	BOURNS
R50	PW2016	RESISTOR, 99.11K, 1/2W, 0.05%	1	NLS
R51 thru R53	Com'l	RESISTOR, 330K, 1W, 10% (Carbon)	3	
R54, R55, R58, R59, R61, R62 & R63	Com'l	RESISTOR, 470 ohms, 1/2W, 5% (Carbon)	7	
R57 & R66	Com'l	RESISTOR, 300 ohms, 1/2W, 5% (Carbon)	2	
R60	Com'l	RESISTOR, 47K, 1/2W, 5% (Carbon)	1	
R65	PW2016	RESISTOR, 125K, 1/2W, 0.01%	1	NLS
R67	Com'l	RESISTOR, 910 ohms 1/2W, 5% (Carbon)	1	
V1 & V2	57S1-GB	TUBE, DUAL TRIODE	2	Sylvania
V3	65ST2S	NEON BULB, 65 Volts	1	Signalite



Amplifier and Relay Drivers, 42-92

CIRCUIT REFERENCE	PART NO.	DESCRIPTION	QTY PER ASSY	MANUFACTURER
C1	ZX2X473K	CAPACITOR, 0.047 MFD, 200V	1	Elpac, Inc.
C2	DD102	CAPACITOR, 0.001 MFD, 1000V	1	Centralab
CR1 thru CR8, CR13, CR14 & CR19 thru CR30	5003-002	DIODE	22	NLS
Q1 thru Q4	2N697	TRANSISTOR	4	Texas Instruments
Q5 thru Q8	2N1309	TRANSISTOR	4	Texas Instruments
Q9, Q10, Q13 & Q15	2N1302	TRANSISTOR	4	Texas Instruments
Q11, Q12, Q14 & Q17 thru Q28	2N1305	TRANSISTOR	15	Texas Instruments
R2 thru R6, R8, R13, R14, & R54	Com'l	RESISTOR, 27K, 1/2W, 5% (Carbon)	9	
R7 & R12	Com'l	RESISTOR, 200 ohms, 1/2W, 5% (Carbon)	2	

CIRCUIT REFERENCE	PART NO.	DESCRIPTION	QTY PER ASSY	MANUFACTURER
R9 & R11	Com'l	RESISTOR, 9.1K, 1/2W, 5% (Carbon)	2	
R10	Com'l	RESISTOR, 910 ohms, 1/2W, 5% (Carbon)	1	
R15, R18, R30 & R33	Com'l	RESISTOR, 22K, 1/2W, 5% (Carbon)	4	
R16, R17, & R32	Com'l	RESISTOR, 10K, 1/2W, 5% (Carbon)	3	
R19 & R20	Com'l	RESISTOR, 11K, 1/2W, 5% (Carbon)	2	
R21 & R22	Com'l	RESISTOR, 75K, 1/2W, 5% (Carbon)	2	
R23, R44, R45, R48, R49, R52, R56 & R57	Com'l	RESISTOR, 27K, 1/2W, 5% (Carbon)	8	
R25 & R28	Com'l	RESISTOR, 3.9K, 1/2W, 5% (Carbon)	2	
R31 & R55	Com'l	RESISTOR, 4.3K, 1/2W, 5% (Carbon)	2	
R37 thru R41	Com'l	RESISTOR, 6.19K, 1/2W, 1% (Carbon)	5	
R43, R46, R47, R50 & R51	Com'l	RESISTOR, 1.3K, 1/2W, 5% (Carbon)	5	
R53 & R58	Com'l	RESISTOR, 47K, 1/2W, 5% (Carbon)	2	
R59	Com'l	RESISTOR, 470 ohms, 1/2W, 5% (Carbon)	1	
R60	Com'l	RESISTOR, 6.81K, 1/2W, 1% (Carbon)	1	
R61	Com'l	RESISTOR, 13K, 1/2W, 1% (Carbon)	1	

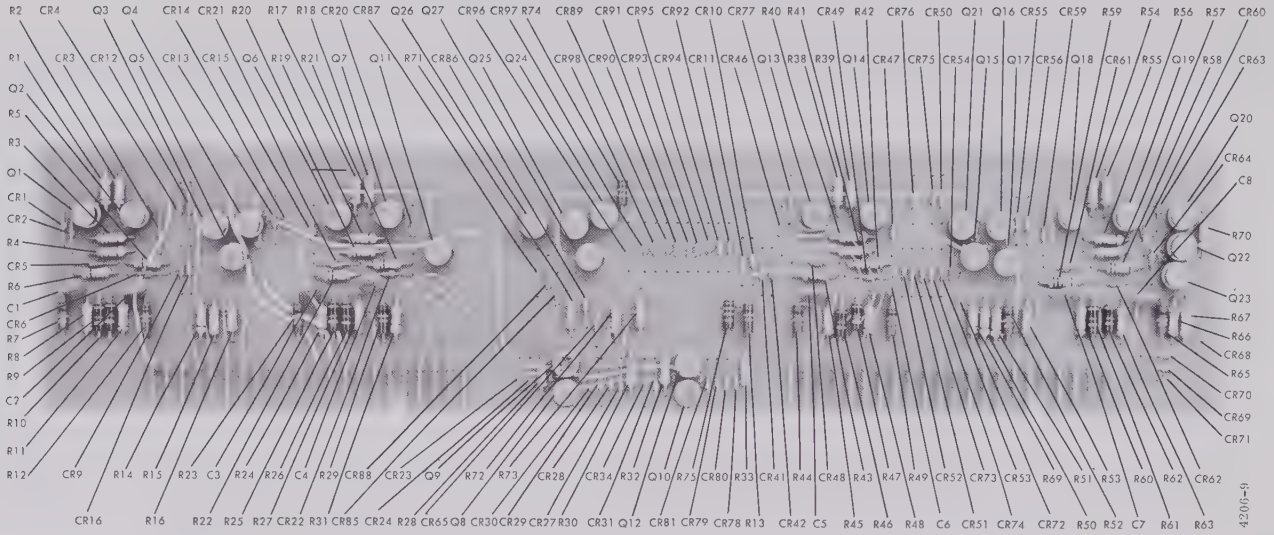


D/A Converter Assy., 42-10

CIRCUIT REFERENCE	PART NO.	DESCRIPTION	QTY PER ASSY	MANUFACTURER
C1	VX1X105	CAPACITOR 1 MFD, 100V	1	Elpac, Inc.
CR1 & CR2	ZT6 Matched Pair	DIODE, ZENER	1	IRC
CR3	1N3024B	DIODE, ZENER, 15V, 1W, 5%	1	Motorola
Q1 thru Q4 & Q7	2N3711	TRANSISTOR	5	Texas Instruments
Q5 & Q6	2N1309	TRANSISTOR	2	Texas Instruments
Q8	2N697	TRANSISTOR	1	Texas Instruments
Q9, Q11, Q13, Q15, Q17, Q19, Q21, Q23, Q25, Q27, Q29, Q31, Q33, Q35, Q37, Q39, Q41, Q43, Q45 & Q47	2N1305	TRANSISTOR	20	Texas Instruments
Q10, Q12, Q14, Q16, Q18, Q20,	2N1302	TRANSISTOR	20	Texas Instruments

CIRCUIT REFERENCE	PART NO.	DESCRIPTION	QTY PER ASSY	MANUFACTURER
Q22, Q24, Q26, Q28, Q30, Q32, Q34, Q36, Q38, Q40, Q42, Q44, Q46 & Q48				
R1, R2 R9, R11, R25 & R26	PW2016	RESISTOR , Value is Factory selected for each inst.	1 ea	NLS
R5, R8 & R10	Com'l	RESISTOR, 40K, 1/2W, 1% (Composition)	3	
R6 & R7	Com'l	RESISTOR, 1K, 1/2W, 1% (Composition)	2	
R12, R13, R14 & R15	Com'l	RESISTOR, 12K, 1/2W, 5% (Composition)	4	
R16	Com'l	RESISTOR, 100 ohms, 1/2W, 5% (Composition)	1	
R17	Com'l	RESISTOR, 200 ohms, 1/2W, 5% (Composition)	1	
R18 & R19	Com'l	RESISTOR, 6.2K, 1/2W, 5% (Composition)	2	
R21	Com'l	RESISTOR, 100K, 1/2W, 5% (Composition)	1	
R23	Com'l	RESISTOR, 20K, 1/2W, 5% (Composition)	1	
R24	PW2016	RESISTOR, 600 ohms, 1/2W, 1%	1	NLS
R27	Com'l	RESISTOR, 430 ohms, 1/2W, 5% (Composition)	1	
R30, R32, R34, R45, R47, R49 & R51	Com'l	RESISTOR, 8.2K, 1/2W, 5% (Composition)	7	
R31, R33, R35, R46, R48, R50 & R52	Com'l	RESISTOR, 470 ohms, 1/2W, 5% (Composition)	7	
R36 thru R38	Com'l	RESISTOR, 75K, 1/2W, 5% (Composition)	3	
R39	PW2016	RESISTOR, 225.3K, 1/2W, 0.01%	1	NLS
R40, R64, R65, R88 & R90	Com'l	RESISTOR, 250K, 1/2W, 0.01% (Composition)	5	
R41, R42, R62, R63, R66, R67, R86, & R87	Com'l	RESISTOR, 125K, 1/2W, 0.01% (Composition)	8	
R43, R61 R68 & R85	Com'l	RESISTOR, 62.5K, 1/2W, 0.01% (Composition)	4	

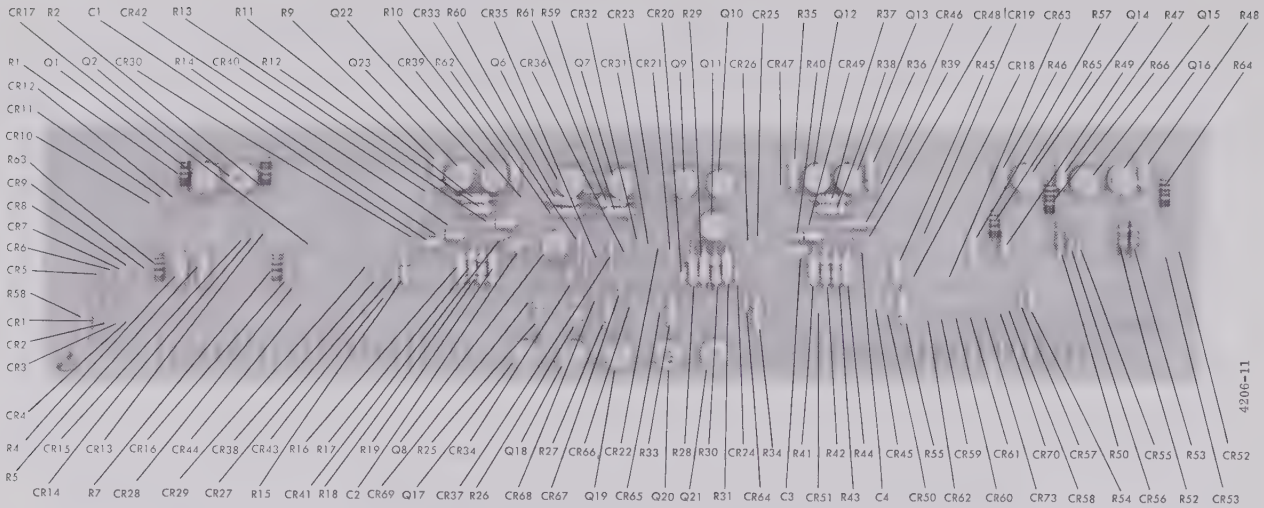
CIRCUIT REFERENCE	PART NO.	DESCRIPTION	QTY PER ASSY	MANUFACTURER
R44 & R89	Com'l	RESISTOR, 225K, 1/2W, 0.01% (Composition)	2	
R53, R56, R58, R60, R70, R72, R74, R76, R77, R80, R82, R84, & R92	Com'l	RESISTOR, 910 ohms, 1/2W, 5% (Composition)	13	
R54, R55, R57, R59, R69, R71, R73, R75, R78, R79, R81, R83 & R91	Com'l	RESISTOR, 16K, 1/2W, 5% (Composition)	13	
R93	Com'l	RESISTOR, 24 ohms, 1/2W, 5% (Composition)	1	



Counters 3 and 4 Assy., 42-65

CIRCUIT REFERENCE	PART NO.	DESCRIPTION	QTY PER ASSY	MANUFACTURER
C1 thru C8	DD102	CAPACITOR, 0.001 MFD, 1000V	8	Centralab
CR1 thru CR6, CR9 thru CR16, CR20 thru CR24, CR27 thru CR31, CR34, CR41, CR42, CR46 thru CR56, CR59 thru CR65, CR68 thru CR81 & CR85 thru CR98	5003-002	DIODE	73	NLS
Q1 thru Q27	2N1305	TRANSISTOR	27	Texas Instruments

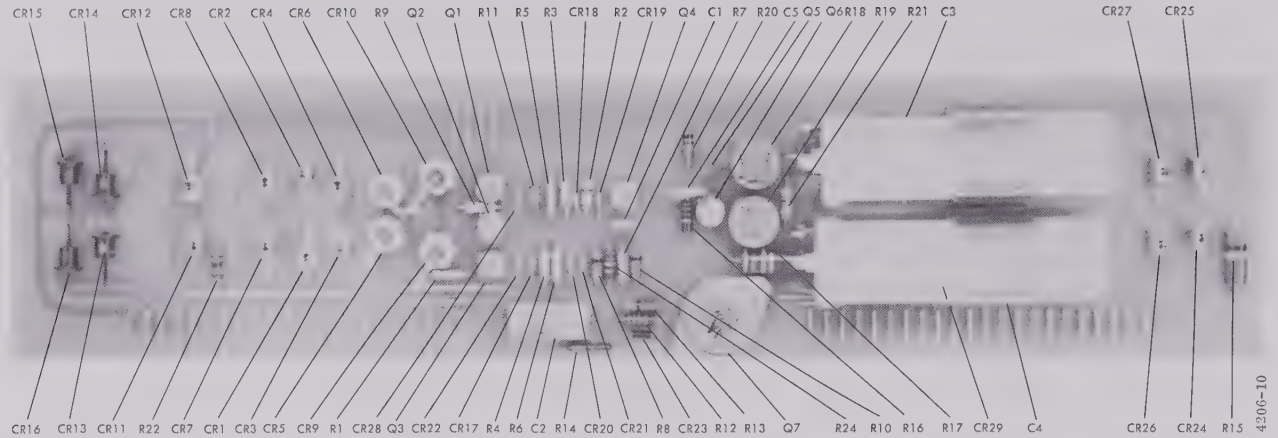
CIRCUIT REFERENCE	PART NO.	DESCRIPTION	QTY PER ASSY	MANUFACTURER
R1, R2, R8, R11, R17, R18, R24, R27, R38, R39, R45, R48, R54, R55, R60 & R63	Com'l	RESISTOR, 47K, 1/2W, 5% (Composition)	16	
R3, R4, R19, R20, R40, R41, R56, & R57	Com'l	RESISTOR, 5.1K, 1/2W, 5% (Composition)	8	
R5, R6, R21, R22, R42, R43, R58 & R59	Com'l	RESISTOR, 1K, 1/2W, 5% (Composition)	8	
R7, R12, R13, R23, R29, R44, R49, R52 & R65	Com'l	RESISTOR, 20K, 1/2W, 5% (Composition)	9	
R9, R10, R25, R26, R46, R47, R61 & R62	Com'l	RESISTOR, 3K, 1/2W, 5% (Composition)	8	
R14 thru R16, R28, R30 thru R33, R50, R51, R53, R66, R67, & R69 thru R73	Com'l	RESISTOR, 27K, 1/2W, 5% (Composition)	18	
R74	Com'l	RESISTOR, 75K, 1/2W, 5% (Composition)	1	
R75	Com'l	RESISTOR, 18K, 1/2W, 5% (Composition)	1	



Range Logic Assy., 42-22

CIRCUIT REFERENCE	PART NO.	DESCRIPTION	QTY PER ASSY	MANUFACTURER
C1 thru C4	DD102	CAPACITOR, 0.001 MFD, 1000V, 10%	4	Centralab
CR1 thru CR53, CR55 thru CR70 & CR73	5003-002	DIODE	70	NLS
Q1 thru Q16, Q18, Q19 & Q21	2N1305	TRANSISTOR	19	Texas Instruments
Q17 & Q20	2N651	TRANSISTOR	2	Motorola
R1 & R2	Com'l	RESISTOR, 75K, 1/2W, 5% (Carbon)	2	
R4, R5, R9, R10, R16, R19, R29, R35, R36, R41, R44, R55, R57 & R58	Com'l	RESISTOR, 47K, 1/2W, 5% (Carbon)	14	
R7 & R63	Com'l	RESISTOR, 18K, 1/2W, 5% (Carbon)	2	

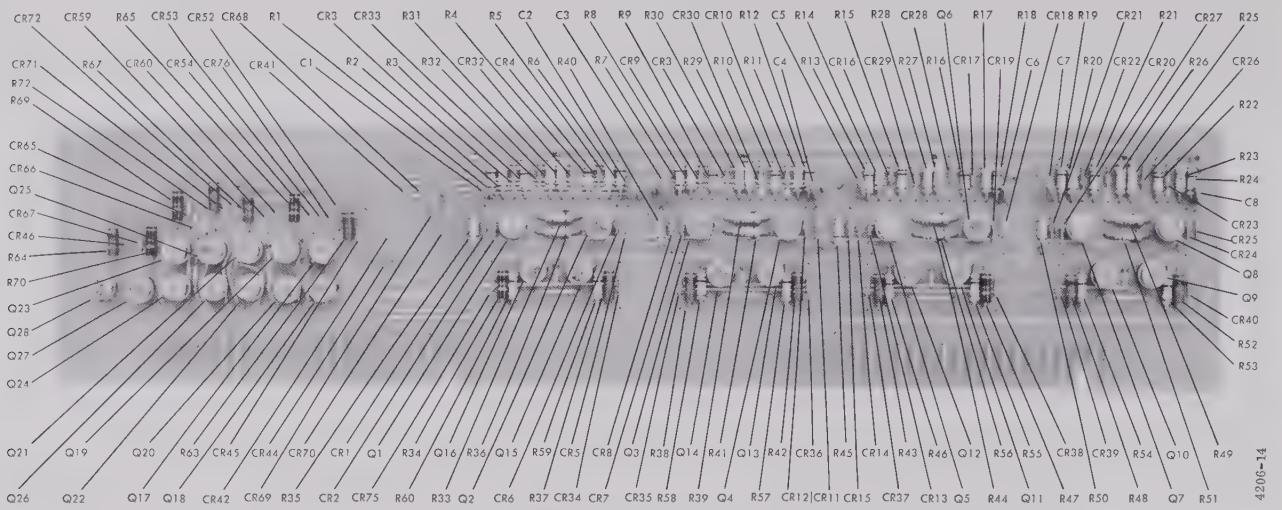
CIRCUIT REFERENCE	PART NO	DESCRIPTION	QTY PER ASSY	MANUFACTURER
R11, R12, R37 & R38	Com'l	RESISTOR, 5.1K, 1/2W, 5% (Carbon)	4	
R13, R14, R39 & R40	Com'l	RESISTOR, 1K, 1/2W, 5% (Carbon)	4	
R15, R30, R45, R49, R54 & R62	Com'l	RESISTOR, 20K, 1/2W, 5% (Carbon)	6	
R17, R18, R25 thru R27, R33, R34, R42 & R43	Com'l	RESISTOR, 3K, 1/2W, 5% (Carbon)	9	
R28, R31, R46 thru R48, & R59 thru R61	Com'l	RESISTOR, 27K, 1/2W, 5% (Carbon)	8	
R50, R52 & R53	Com'l	RESISTOR, 6.8K 1/2W, 5% (Carbon)	3	
R64 thru R66	Com'l	RESISTOR, 4.3K, 1/2W, 5% (Carbon)	3	



Power Supply Assy, 42-83

CIRCUIT REFERENCE	PART NO.	DESCRIPTION	QTY PER ASSY	MANUFACTURER
C1	DD102	CAPACITOR, 0.001 MFD, 10%, 1000V	1	Centralab
C2	VX2756	CAPACITOR, 2.0 MFD, 20%, 100V	1	Elpac, Inc.
C3 & C4	20B349	CAPACITOR, 180 MFD, 200V	2	Industrial Cond.
C5	VX1J103J	CAPACITOR, 0.01 MFD, 100V	1	Elpac, Inc.
CR1 thru CR4, CR7, CR8, CR11, CR12, & CR24 thru CR27	1N537	DIODE	12	General, Electric
CR5, CR6, CR9 & CR10	1N1124R	DIODE	4	Texas Instruments
CR13 thru CR16	1N540	DIODE	4	General Electric
CR17 thru CR22, CR28 & CR29	5003-002	DIODE	8	NLS
CR23	1N751A	DIODE	1	Motorola
Q1 thru Q4	2N1305	TRANSISTOR	4	Texas Instruments

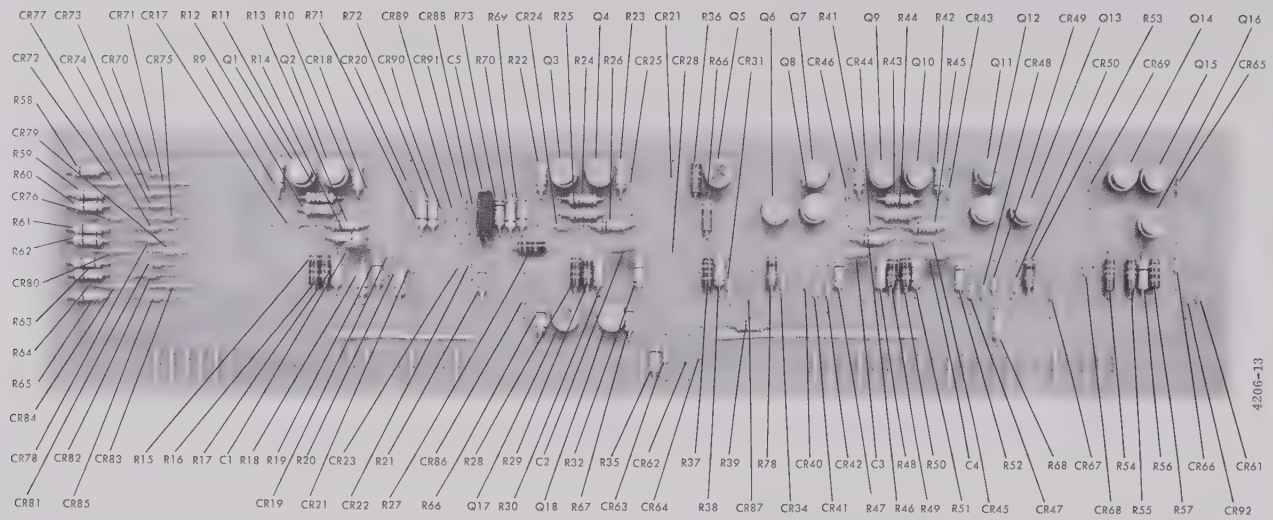
CIRCUIT REFERENCE	PART NO.	DESCRIPTION	QTY PER ASSY	MANUFACTURER
Q5	2N3711	TRANSISTOR	1	Texas Instruments
Q6	2N697	TRANSISTOR	1	Texas Instruments
Q7	2N669	TRANSISTOR, GERMANIUM POWER	1	Motorola
R1 R3, R4, R6 & R9	Com'l	RESISTOR, 47K, 1/2W, 5% (Carbon)	5	
R2 & R21	Com'l	RESISTOR, 1K, 1/2W, 5% (Carbon)	2	
R5 & R7	Com'l	RESISTOR, 5.1K, 1/2W, 5% (Carbon)	2	
R8 & R10	Com'l	RESISTOR, 3K, 1/2W, 5% (Carbon)	2	
R11	Com'l	RESISTOR, 27K, 1/2W, 5% (Carbon)	1	
R12	Com'l	RESISTOR, 1.1K, 1/2W, 5% (Carbon)	1	
R13	Com'l	RESISTOR, 36 ohms, 1/2W, 5% (Carbon)	1	
R14	Com'l	RESISTOR, 100 ohms, 1W, 1% (Carbon)	1	
R15	Com'l	RESISTOR, 15 ohms, 2 W, 5% (Carbon)	1	
R16	Com'l	RESISTOR, 160 ohms, 1/2W, 5% (Carbon)	1	
R17	Com'l	RESISTOR, 82K, 2W, 5% (Carbon)	1	
R18	PW 2016	RESISTOR, 11K, 1/2W 1%	1	NLS
R19	PW2016	RESISTOR, 10K, 1/2W, 1%	1	NLS
R20	Com'l	RESISTOR, 200 ohms 1/2W, 5% (Carbon)	1	
R22	Com'l	RESISTOR, 43 ohms, 1/2W, 5% (Carbon)	1	
R24	Com'l	RESISTOR, 22K, 1/2W, 5% (Carbon)	1	



Decade Assy., 42-75

CIRCUIT REFERENCE	PART NO.	DESCRIPTION	QTY PER ASSY	MANUFACTURER
C1 thru C8	DD102	CAPACITOR, 0.001 MFD, 1000V, 10%	8	Centralab
CR1 thru 42, 44 thru 46, 52 thru 54, 59, 60, 65 thru 72, 75 & 76	5003-002	DIODE	60	NLS
Q1 thru Q28	2N1305	TRANSISTOR	28	Texas Instruments
R1, R6, R7, R12, R13, R18, R19, R24 & R53 thru R60	Com'l	RESISTOR, 20K, 1/2W, 5% (Carbon)	16	

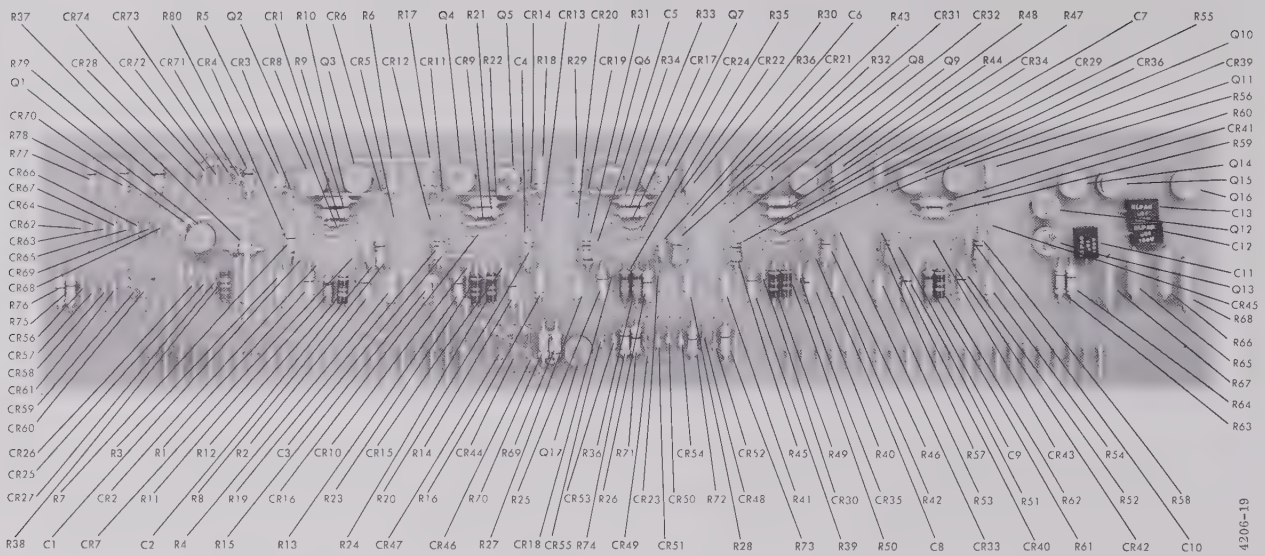
CIRCUIT REFERENCE	PART NO.	DESCRIPTION	QTY PER ASSY	MANUFACTURER
R2, R5, R8, R11, R14, R17, R20, R23 & R25 thru R32	Com'l	RESISTOR, 47K, 1/2W, 5% (Carbon)	16	
R3, R4, R9, R10, R15, R16, R21 & R22	Com'l	RESISTOR, 1K, 1/2W, 5% (Carbon)	8	
R33, R36, R39, R41, R44, R46, R49 & R51	Com'l	RESISTOR, 5.1K, 1/2W, 5% (Carbon)	8	
R34, R37, R38, R42, R43, R47, R48, R52, R63 thru R65, R67, R69, R70 & R72	Com'l	RESISTOR, 3K, 1/2W, 5% (Carbon)	15	
R35, R40, R45 & R50	Com'l	RESISTOR, 13K, 1/2W, 5% (Carbon)	4	



Sync and Polarity Flip Flops, 42-89

CIRCUIT REFERENCE	PART NO.	DESCRIPTION	QTY PER ASSY	MANUFACTURER
C1 thru C4	DD102	CAPACITOR, 0.001 MFD, 1000V, 10%	4	Centralab
C5	ZX2X473K	CAPACITOR, 0.047 MFD, 200V	1	Elpac, Inc.
CR17 thru 25, 27, 28, 31, 34, 40 thru 50, & 60 thru 92	5003-002	DIODE	57	NLS
Q1 thru Q6, Q8 thru Q10, & Q12 thru Q18	2N1305	TRANSISTOR	16	Texas Instruments
Q7 & Q11	2N1302	TRANSISTOR	2	Texas Instruments
R9, R10, R17, R22, R23, R30, R38, R41, R42, R48, R51, R68	Com'l	RESISTOR, 47K, 1/2W, 5%, (Carbon)	12	

CIRCUIT REFERENCE	PART NO.	DESCRIPTION	QTY PER ASSY	MANUFACTURER
R11, R12, R24, R25, R43, & R44	Com'l	RESISTOR, 5.1K, 1/2W, 5% (Carbon)	6	
R13, R26, R45, R46 & R73	Com'l	RESISTOR, 1K, 1/2W, 5% (Carbon)	5	
R14, R18, R28 & R69 thru R72	Com'l	RESISTOR, 13K, 1/2W, 5% (Carbon)	7	
R15, R16, R28, R29, R49, & R50	Com'l	RESISTOR, 3K, 1/2W, 5% (Carbon)	6	
R19, R21, R32, R35, R39, R47, R52, R56, R58, R59 thru R67 & R78	Com'l	RESISTOR, 20K, 1/2W, 5% (Carbon)	19	
R66	Com'l	RESISTOR, 4.3K, 1/2W, 5% (Carbon)	1	
R27 & R37	Com'l	RESISTOR, 6.8K, 1/2W, 5% (Carbon)	2	
R36, R53 thru R55, & R57	Com'l	RESISTOR, 27K, 1/2W, 5% (Carbon)	5	



Counters 1 and 2, 42-86

CIRCUIT REFERENCE	PART NO.	DESCRIPTION	QTY PER ASSY	MANUFACTURER
C1 thru C10	DD102	CAPACITOR, 0.001 MFD, 1000V	10	Centralab
C11 thru C13	VX1J103J	CAPACITOR, 0.01 MFD, 100V	3	Elpac, Inc.
CR1 thru 36, and CR39 thru CR74	5003-002	DIODE	72	NLS
Q1 thru Q11 & Q13 thru Q17	2N1305	TRANSISTOR	16	Texas Instruments
Q12	2N1302	TRANSISTOR	1	Texas Instruments
R1, R2, R13, R14, R25, R26, R37, R39, R40, R51, R52, R63 & R71 thru R80	Com'l	RESISTOR, 20K, 1/2W, 5% (Carbon)	22	

CIRCUIT REFERENCE	PART NO.	DESCRIPTION	QTY PER ASSY	MANUFACTURER
R3 thru R6, R15 thru R18, R27 thru R30, R41 thru R44, R53 thru R56 & R69	Com'l	RESISTOR, 47K, 1/2W, 5% (Carbon)	21	
R7, R8 R19, R20, R31, R32, R45, R46, R57 & R58	Com'l	RESISTOR, 1K, 1/2W, 5% (Carbon)	10	
R9, R10 R21, R22, R33, R34, R47, R48, R59 & R60	Com'l	RESISTOR, 5.1K, 1/2W, 5% (Carbon)	10	
R11, R12, R23, R24, R35, R36, R49, R50, R61 & R62	Com'l	RESISTOR, 3K, 1/2W, 5% (Carbon)	10	
R38	Com'l	RESISTOR, 13K, 1/2W, 5% (Carbon)	1	
R64	Com'l	RESISTOR, 10K, 1/2W, 5% (Carbon)	1	
R65 & R66	Com'l	RESISTOR, 28.7K, 1/2W, 1% (Carbon)	2	
R67 & R68	Com'l	RESISTOR, 5.62K, 1/2W, 1% (Carbon)	2	
R70	Com'l	RESISTOR, 27K, 1/2W, 5% (Carbon)	1	

APPENDIX

SHIPPING INSTRUCTIONS

Depending upon location, the choice of carrier will vary. Never ship an instrument to us without having received shipping instructions. If requested, an estimate of charges can be made before work begins.

Be certain to pack the instrument carefully; while an outer and inner box, separated by two or three inches of excelsior is desirable, the instrument can be placed into a single container provided it is so packed that it will not shift about. As with the double box method, use two or three inches of shock-absorbent packing materials. The instrument itself should be first wrapped in heavy paper so as to keep excelsior or other particles from entering the instrument's louvres. If the original shipping container is in good condition, it may be used.

CLAIM FOR DAMAGE IN SHIPMENT

The instrument should be tested as soon as it is received. If it does not operate or is damaged, a claim should be made with the carrier. The claim agent should receive a full report of damage, and this report sent to Non-Linear Systems, Inc. After receiving such a report we will advise you of the disposition of the instrument and arrange for its repair or replacement. Be certain to include model and serial number when corresponding.

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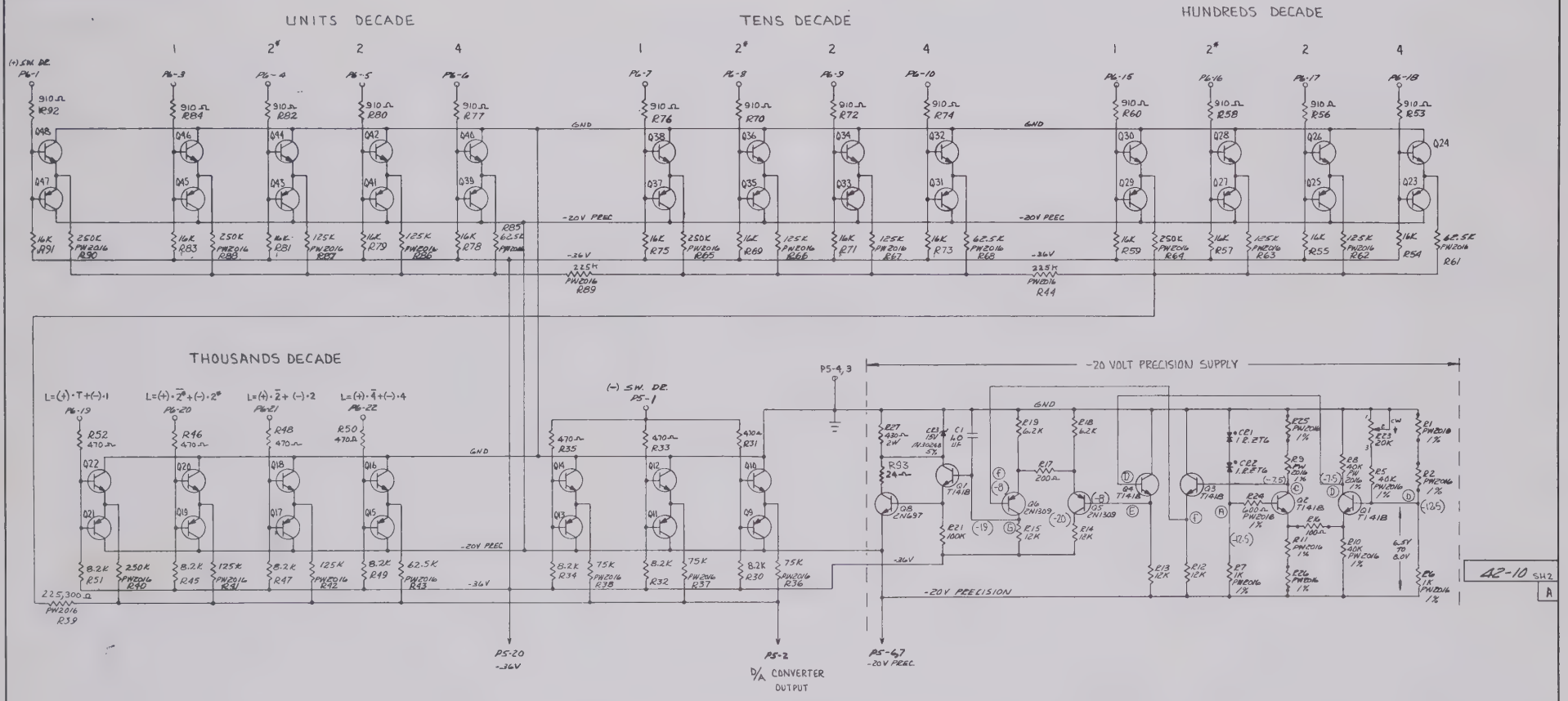
REVISIONS					
SYM	ZONE	EFFECT.	DESCRIPTION	DATE	APPROVED
A		3/4/60	R39 was 225 Ω	1/4/61	



9. VOLTAGES IN PARENTHESES ARE TYPICAL FOR THE BALANCED STATE OF THE -20V. PREC. AMPLIFIER, CIRCLED LETTERS INDICATE PHASE RELATIONSHIPS.

8. A6 Q'S = TRANSISTORS
A6 C'S = CAPACITORS
A6 R'S = RESISTORS
A6 CR'S = DIODES
REFERENCE DESIGNATIONS ARE ABBREVIATED PREFIX THE DESIGNATION WITH THE UNIT NUMBER OR ASSEMBLY DESIGNATION OR BOTH.

7. CR1 & CR2 DIODES AND Q1 & Q2 TO BE FACTORY SELECTED
6. ALL NPN TRANSISTORS 2N1302
5. ALL PNP TRANSISTORS 2N1305.
4. ALL PW2016 RESISTORS TO BE .01% OR BETTER
3. CE1 & CE2 ARE MATCHED FOR LOW TEMP. COEFF.
2. R1, E2, R9, R11, R25 & R26 TO BE FACTORY SELECTED
1. ALL RESISTORS ½W, 5% COMP.

NOTES: UNLESS OTHERWISE SPECIFIED

QTY REQD	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	MFR. CODE	CIRCUIT REF.	ITEM NO.	NEXT ASSY.	FINAL ASSY.	NEXT ASSY.	FINAL ASSY.
		PARTS LIST				APPLICATION		QTY.	
						42-135		1	
						42-93 & 97			
						Final 42-34		1	1

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
TOLERANCES ON
DECIMALS ± .010 ANGLES ± 0° 30'
FRACTIONS ± 1/32
SURFACE ROUGHNESS PER MIL-STD-10 ✓
DO NOT SCALE THIS DRAWING
RELEASE DATE 10-8-64

DRAWN J. Dunbar 6/12/64
CHECK [illegible] 7-8-64
APPR [illegible] 7-9-64
MATERIAL
FINISH

NON-LINEAR SYSTEMS, INC.
DEL. MAR, CALIFORNIA

SCHEMATIC DIAGRAM -
A6 DIGITAL-TO ANALOG CONVERTER
SERIES 4200

CODE IDENT NO. 03626 | SIZE D | 42-10
SCALE | WEIGHT | SHEET 2

THE INFORMATION DISCLOSED HEREIN WAS ORIGINATED BY AND IS THE PROPERTY OF NON-LINEAR SYSTEMS INC. AND EXCEPT FOR RIGHTS EXPRESSLY GRANTED TO THE UNITED STATES GOVERNMENT, NON-LINEAR SYSTEMS INC. RESERVES ALL PATENT, PROPRIETARY, DESIGN, USE, SALE, MANUFACTURING AND REPRODUCTION RIGHTS THEREIN.

REVISIONS					
SYM	ZONE	EFFECT.	DESCRIPTION	DATE	APPROVED
1		S/N 1-	CHANGE P13-13 MANUAL 100V TO P13-13 MANUAL 1000V ON RS2 F.F.. CHANGE P14-19 R-X AT JUNCTION CR58 AND RS4 TO READ P14-6 R-X	9-23-64	Hoffheimer
2		S/N 26	Added CR70. P13-13 was manual 1000V	10-7-64	Hoffheimer

PIN P13-21 D1000 ?
PIN P13-20 D100
PIN P13-19 D10-?
PIN P13-18 D1-?
PIN P13-17 M1
CR5 CR6 CR7 CR8 CR9
+27V
+6V P13-10
R1 75K
R2 75K
Q1 Q2
CR10 CR11 CR12 CR13 CR14 CR15
R63 18K
R4 47K
R5 47K
R7 18K
D1000-0 PIN P13-14
RS2
CR16 CR17
-15V
PIN P13-16 E3
PIN P13-15 E1

SET RS1-FF
PIN P14-14 R-X RS1
CR18 CR19
R45 20K
-15V
ZERO RS1-FF

PIN P14 14 R-X RS1 RS2 D1000-0
CR20 CR21 CR22 CR23
PIN P14-22 +1.5V
Q9 Q10
R28 27K
R29 47K
R30 20K
-15V
PIN P14-14 R-X RS2 E2
CR24 CR25 CR26
P14-14 P13-14 R-X D1000-0 RS1 RS2
CR27 CR28 CR29 CR30
R31 27K
-15V
P13-1
Q11
R15 20K
ZERO RS2-FF
-15V
ZERO RS1-FF

RS1 RS2 E2 R-X
CR31 CR32 CR33 CR34
PIN P14-22 +1.5V
Q7 Q6
RS1 RS2 P13-2 92
CR35 CR36 CR37
P13-1
Q8
R59 27K
R60 27K
R61 27K
R62 20K
-15V
SET RS2-FF

D1000-9
D100-9
D10-9
D1-9
CR1 CR2 CR3 CR4
E2
R58 47K
-15V

ZERO +6V P13-10 SET
C3 C4
CR46 CR47
47K R44 47K
-15V -15V
R40 1K R39 1K
CR48 CR49
+27V +6V
47K R36
MANUAL 1000V P14-15
MANUAL 10V P14-18
CR50 CR51
Q13
R43 3K R37 5.1K
RS1
47K R35
+27V +6V
Q12
CR45
MANUAL 100V PIN P14-16
5.1K R38
R42 3K
RS1-FF

ZERO P13-10 +6V SET
C1 C2
CR40 CR39
47K R16 47K R19
-15V -15V
R14 1K R13 1K
CR41 CR42
47K R10
+27V +6V
47K R9
MANUAL 1000V PIN P13-6
MANUAL 100 V P13-13
CR43 CR44
Q22 Q23
CR38
MANUAL 10V PIN P13-7
RS2
5.1K R11 5.1K R12
R18 3K R17 3K
RS2-FF

Q4 PIN P14-1
Q3 PIN P14-2
CR52 CR53
PIN P13-11 +27V
+6V
R48 27K R47 27K
Q16 Q15
R64 4.3K R66 4.3K
R53 6.8K
R65 4.3K
R52 6.8K
R46 27K
Q14
R49 20K
R50 6.8K
PIN P14-4 E4
PIN P14-5 E3
X
R PIN P14-13
CR55 CR56 CR57 CR58
R-X PIN P14-6
R54 20K
-15V
P14-12 E1
X
CR62 CR63
R-X PIN P14-14
R55 47K
-15V PIN P13-8
-15V PIN P13-8
+27V
PIN P14-3 +6V

P14-7 Q2
P14-11 b2
P14-10 92
P14-9 a3
P14-8 b3
CR70 CR59 CR60 CR61 CR73
X=b3·a3·92·b2·a2
R57 47K
-15V

RS1 RS1 RS1 RS2 RS2 RS2
PIN P13-1 GND
CR64 CR65 CR66 CR67 CR68 CR69
Q21 Q20 2N651 Q19 Q18 2N651 Q17
R34 3K R33 3K R27 3K R26 3K R25 3K
100V DECIMAL LITE PIN P14-20
K7 RANGE RELAY DRIVE (H=100V RANGE) PIN P14-19
1000V DECIMAL LITE PIN P13-5
10 V DECIMAL LITE PIN P13-4
K6 RANGE RELAY DRIVE (H=10V RANGE) PIN P13-3

RANGE	RS2	RS1
—	0	0
10	0	1
100	1	0
1000	1	1

"0" = +6V
"1" = -8V ± 4

A10 Q'S = TRANSISTORS
A10 C'S = CAPACITORS
A10 R'S = RESISTORS
A10 CR'S = DIODES
5. REFERENCE DESIGNATIONS ARE ABBREVIATED. PREFIX THE DESIGNATION WITH THE UNIT NUMBER OR ASSEMBLY DESIGNATION OR BOTH
4. ALL CAPACITORS 0.001 UF, 1KV
3. ALL TRANSISTORS 2N1305
2. ALL DIODES NLS 5003-002
1. ALL RESISTORS ½W, 5% CARBON
NOTES: UNLESS OTHERWISE SPECIFIED,

42-22 SH2
2

QTY REQD	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	MFR. CODE	CIRCUIT REF.	ITEM NO.	NEXT ASSY.	FINAL ASSY.	NEXT ASSY.	FINAL ASSY.
						—	42-34 [illegible]	—	1
		PARTS LIST				APPLICATION		QTY.	

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
TOLERANCES ON
DECIMALS ± .010
ANGLES ± 0° 30'
FRACTIONS ± 1/32
SURFACE ROUGHNESS PER MIL-STD-10 ✓
DO NOT SCALE THIS DRAWING
RELEASE DATE 10-8-64

DRAWN	D. DES JARDIN	8-18-64
CHECK	Rine	8/24/64
APPR	Hoffheimer	8/20/64

MATERIAL
FINISH

NON-LINEAR SYSTEMS, INC.
DEL MAR, CALIFORNIA

-SCHEMATIC DIAGRAM-
A10 RANGE LOGIC
MODEL: 4200 SERIES

CODE IDENT NO.	SIZE	
03626	D	42-22
SCALE	WEIGHT	SHEET 2

DIETERICH-POST CLEARPRINT 1000-1-58

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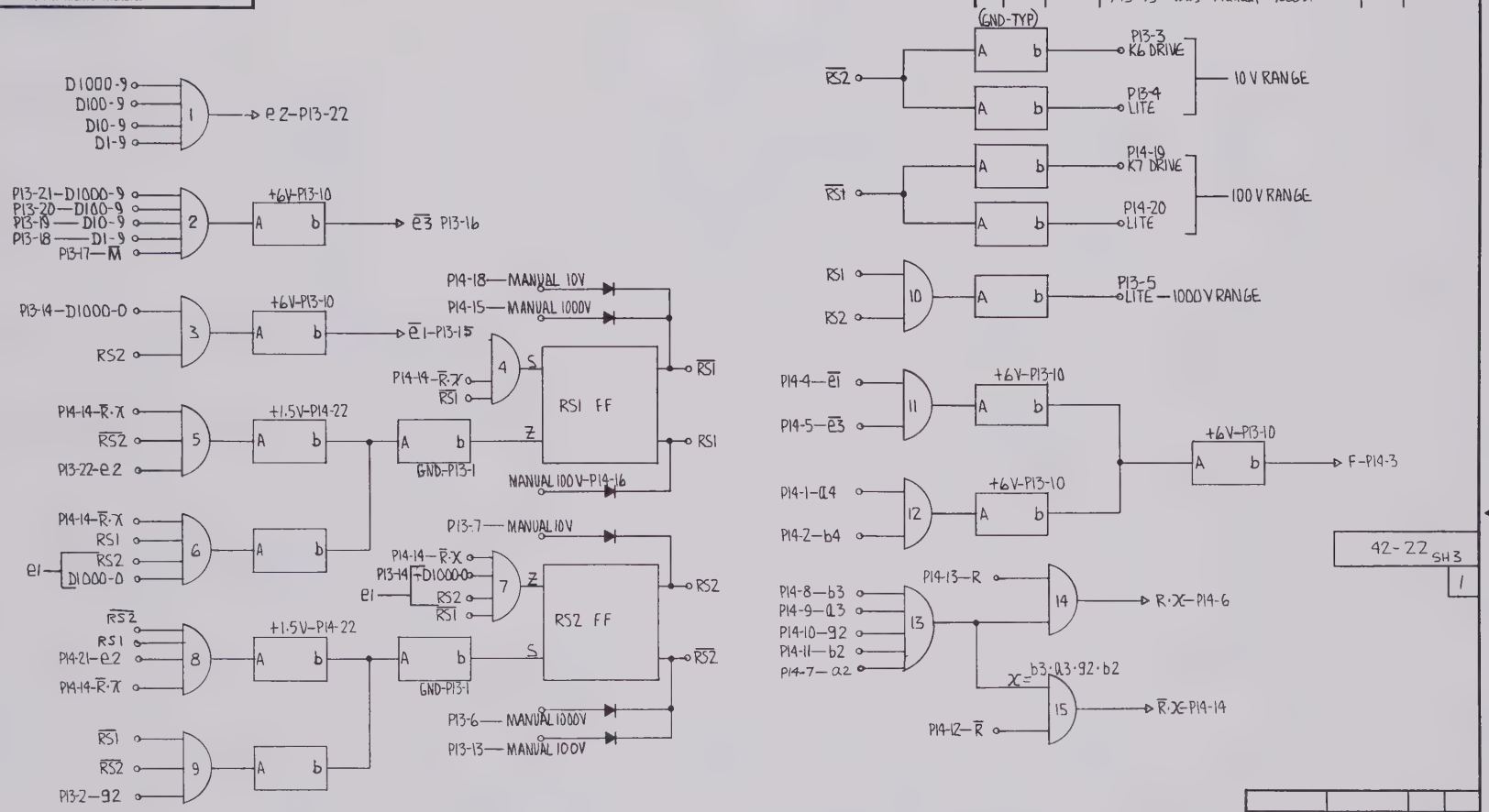
REVISIONS					
SYM	ZONE	EFFECT.	DESCRIPTION	DATE	APPROVED
1		S/N 26	Added a2 to gate 13 P13-13 was Manual 1000V.	10-7-64	Hoffmeister



1. P's = PIN NUMBERS.
NOTES: UNLESS OTHERWISE SPECIFIED.

QTY REQD	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	MFR. CODE	CIRCUIT REF.	ITEM NO.	NEXT ASSY.	FINAL ASSY.	NEXT ASSY.	FINAL ASSY.
		PARTS LIST				APPLICATION		QTY.	
						FINAL	42-34 & 43	1	1

UNLESS OTHERWISE SPECIFIED	DRAWN	DES JARDIN 8-15-64
DIMENSIONS ARE IN INCHES TOLERANCES ON DECIMALS ± .010 ANGLES ± 0° 30' FRACTIONS ± 1/32	CHECK	Brue 9-23-64
	APPR	Hoffmeister 9/23/64
	MATERIAL	
SURFACE ROUGHNESS PER MIL-STD-10 ✓		
DO NOT SCALE THIS DRAWING	FINISH	
RELEASE DATE 10-8-64 E		

NON-LINEAR SYSTEMS, INC.
DEL MAR, CALIFORNIA

RANGE LOGIC BLOCK DIAGRAM

SERIES 4200

CODE IDENT NO.	SIZE	
03626	C	42-22
SCALE	WEIGHT	SHEET 3

DIETERICH-POST CLEARPRINT 1000H-10

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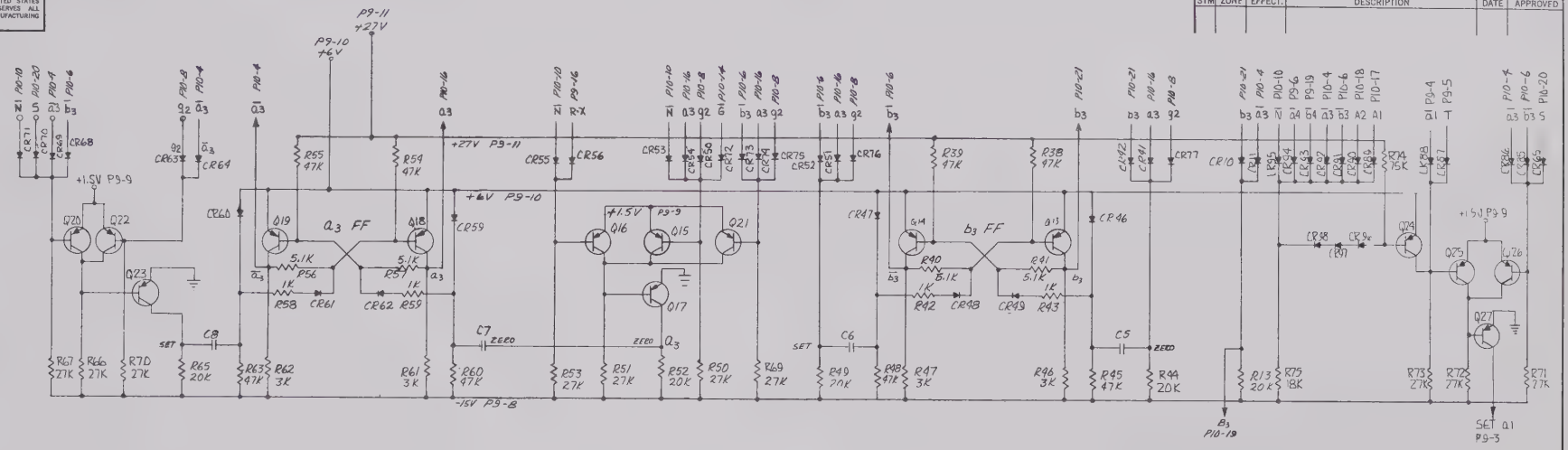
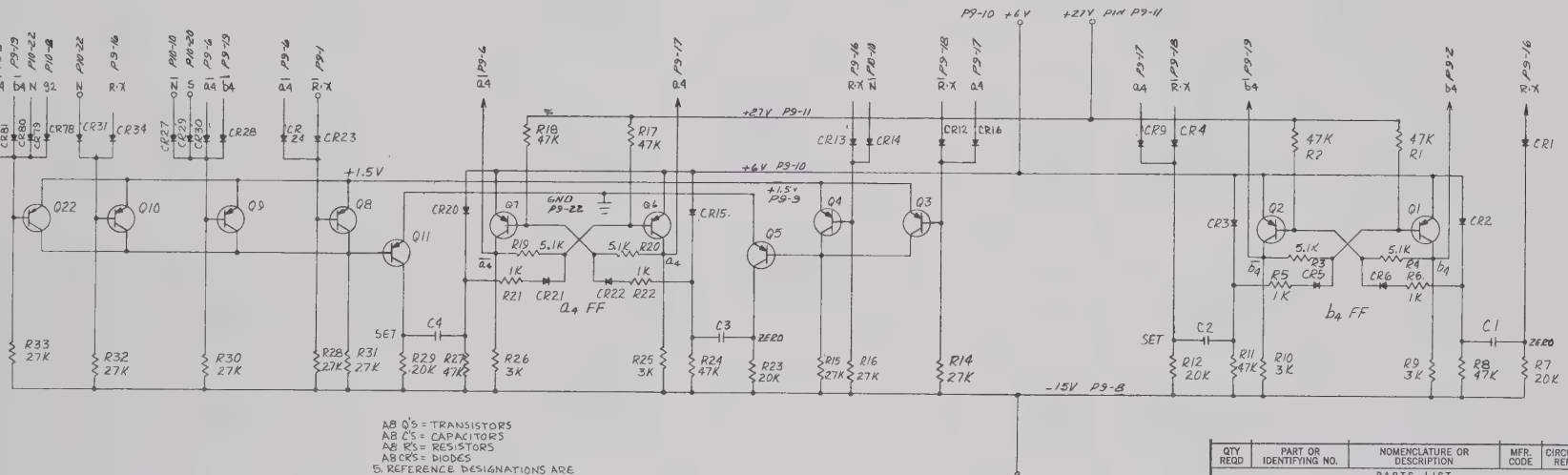
REVISIONS					
SYM	ZONE	EFFECT.	DESCRIPTION	DATE	APPROVED





AB Q's = TRANSISTORS
AB C's = CAPACITORS
AB R's = RESISTORS
AB CR's = DIODES
5. REFERENCE DESIGNATIONS ARE ABBREVIATED. PREFIX THE DESIGNATIONS WITH THE UNIT NUMBER OR ASSEMBLY DESIGNATION OR BOTH.

4. ALL RESISTORS ½ W, 5%, CO.I.R.
3. ALL TRANSISTORS 2N1305
2. ALL DIODES NLS 5003-002
1. ALL CAPACITORS 0.001 uf, 1000 V

NOTES: UNLESS OTHERWISE SPECIFIED

QTY REQD	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	MFR. CODE	CIRCUIT REF.	ITEM NO.	NEXT ASSY.	FINAL ASSY.	NEXT ASSY.	FINAL ASSY.
		PARTS LIST				—	A7-629 61		
						APPLICATION		QTY.	

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
TOLERANCES ON
DECIMALS ± .010 ANGLES ± 0° 30'
FRACTIONS ± 1/32
SURFACE ROUGHNESS PER MIL-STD-10 ✓
DO NOT SCALE THIS DRAWING
RELEASE DATE 2/18/65

DRAWN M Davidson 1/27/65
CHECK Tyme 1-26-65
APPR Hoffman 1-26-65
MATERIAL
FINISH

NON-LINEAR SYSTEMS, INC.
DEL MAR, CALIFORNIA

SCHEMATIC DIAGRAM — AB-COUNTERS 3 AND 4. SERIES 4200

CODE IDENT NO.	SIZE	
03626	D	42-65
SCALE	WEIGHT	SHEET 2

DIETZGEN-POST CLEARPRINT 100SH-58

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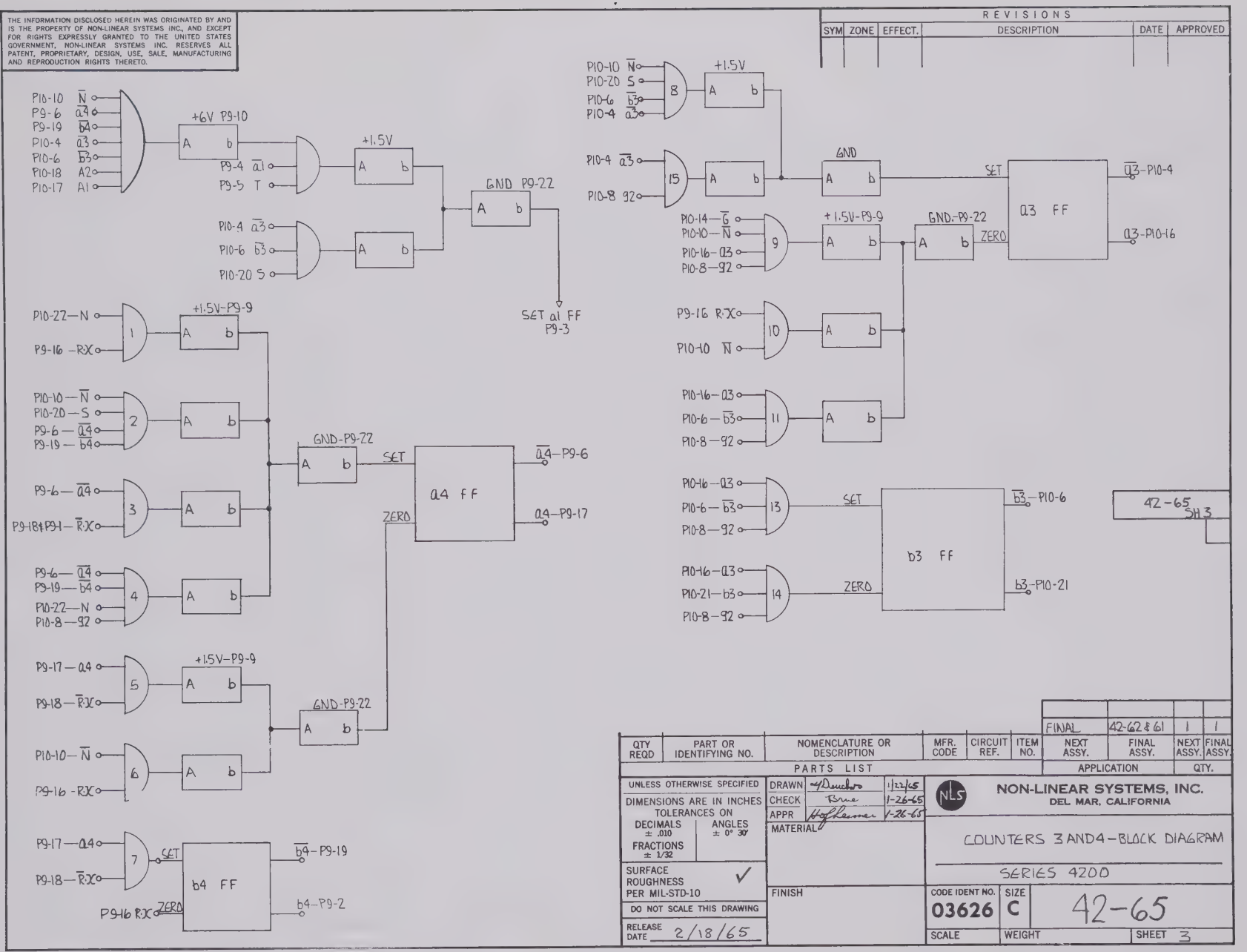
REVISIONS					
SYM	ZONE	EFFECT.	DESCRIPTION	DATE	APPROVED



QTY REQD	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	MFR. CODE	CIRCUIT REF.	ITEM NO.	NEXT ASSY.	FINAL ASSY.	NEXT ASSY.	FINAL ASSY.
		PARTS LIST				APPLICATION		QTY.	
						FINAL	42-62 & 61	1	1

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
TOLERANCES ON
DECIMALS ± .010
ANGLES ± 0° 30'
FRACTIONS ± 1/32
SURFACE ROUGHNESS PER MIL-STD-10 ✓
DO NOT SCALE THIS DRAWING
RELEASE DATE 2/18/65

DRAWN [illegible] 1/22/65
CHECK Brue 1-26-65
APPR Hoffmann 1-26-65
MATERIAL
FINISH

NON-LINEAR SYSTEMS, INC.
DEL MAR, CALIFORNIA

COUNTERS 3 AND 4 - BLOCK DIAGRAM

SERIES 4200

CODE IDENT NO. 03626 | SIZE C | 42-65 | SCALE | WEIGHT | SHEET 3

DIETERICH-POST CLEARPRINT 100DH-10

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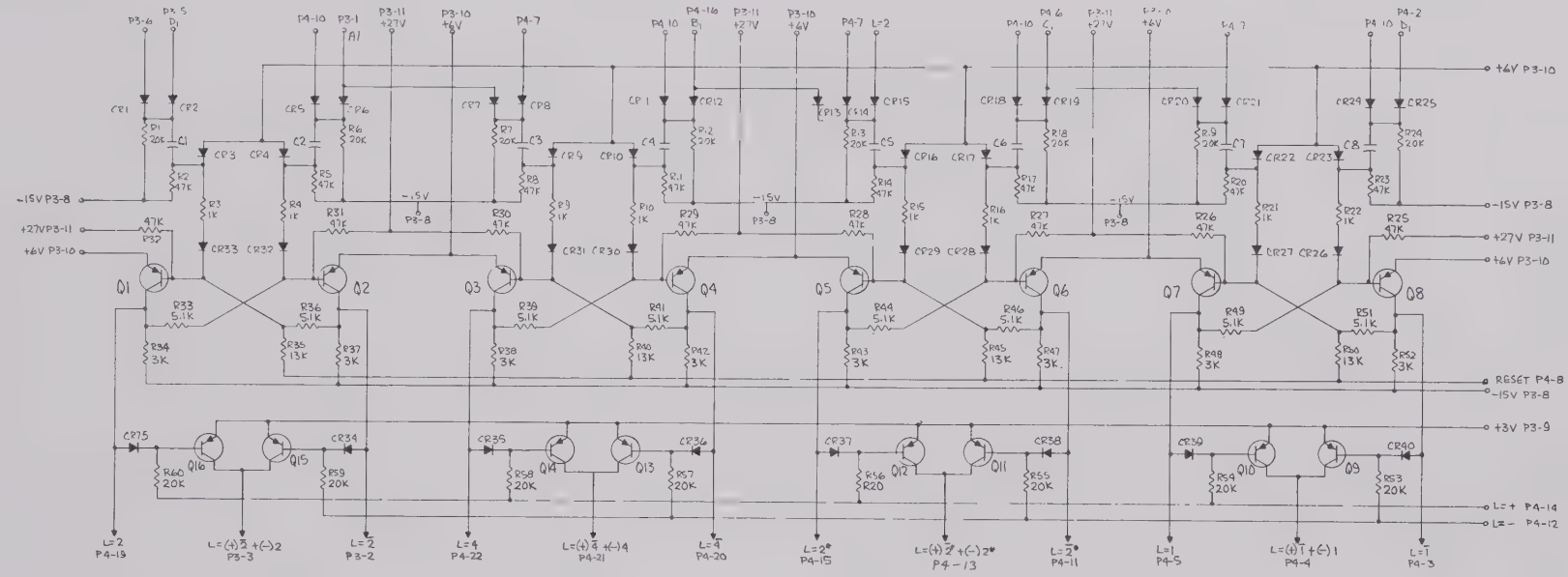
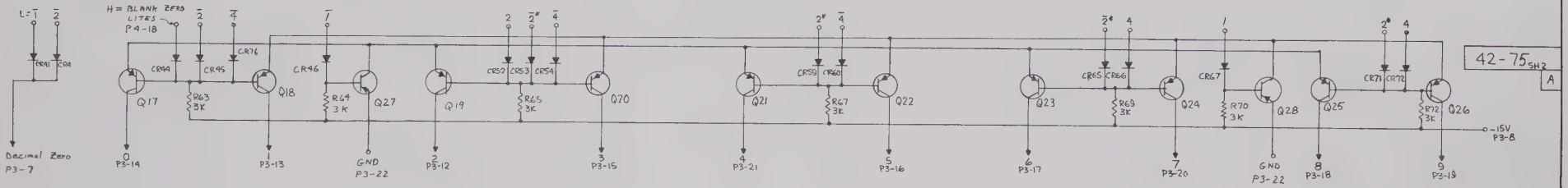
REVISIONS					
SYM	ZONE	EFFECT.	DESCRIPTION	DATE	APPROVED
F		S/N 150	Added diode CR76	3-9-65	Hoffman





42-75 SH2 A

A2,3,4&5 Q's = TRANSISTORS
A2,3,4&5 C's = CAPACITORS
A2,3,4&5 R's = RESISTORS
A2,3,4&5 CR's = DIODES

5. REFRENCE DESIGNATIONS ARE ABBREVIATED. PREFIX THE DESIGNATION WITH THE UNIT NUMBER OR ASSEMBLY DESIGNATION OR BOTH.
4. ALL TRANSISTORS 2N1305
3. ALL DIODES NLS 5003-002
2. ALL RESISTORS ½ W, 5%, CARBON
1. ALL CAPACITORS 0.001 uf, 1000 V

NOTES: UNLESS OTHERWISE SPECIFIED

* A2, A3, A4, & A5

QTY REQD	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	MFR. CODE	CIRCUIT REF.	ITEM NO.	Final NEXT ASSY.	42-62 FINAL ASSY.	4 NEXT ASSY.	4 FINAL ASSY.
PARTS LIST						APPLICATION		QTY.	

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
TOLERANCES ON
DECIMALS ± .010
ANGLES ± 0° 30'
FRACTIONS ± 1/32
SURFACE ROUGHNESS PER MIL-STD-10 ✓
DO NOT SCALE THIS DRAWING
RELEASE DATE 3-17-65

DRAWN	Bruce	1-27-65
CHECK		
APPR	Hoffman	1-27-65
MATERIAL		
FINISH		

NON-LINEAR SYSTEMS, INC.
DEL MAR, CALIFORNIA

-SCHEMATIC DIAGRAM- *DECADE BOARD

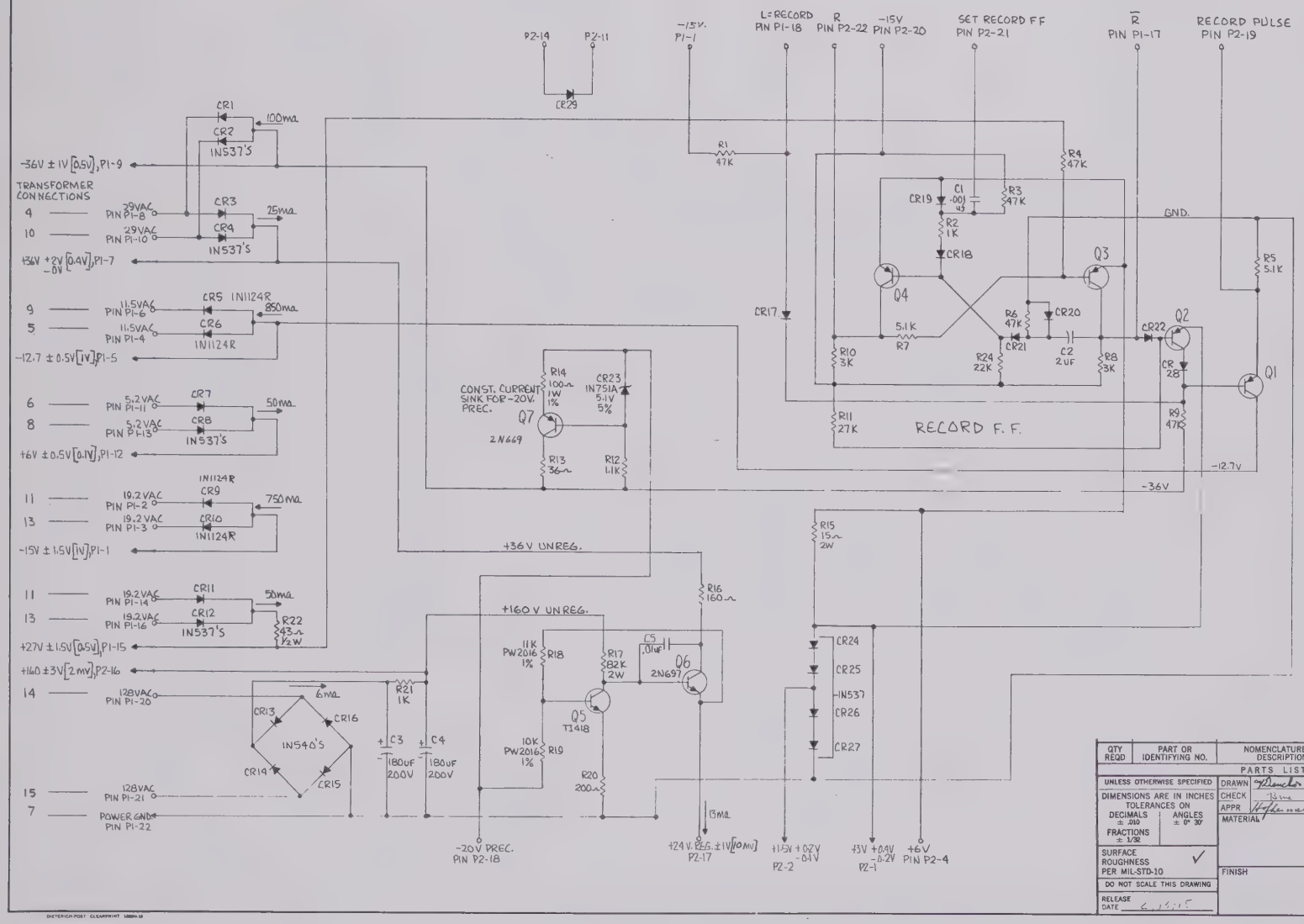
MODEL: SERIES 9200

CODE IDENT NO.	SIZE	
03626	D	42-75
SCALE	WEIGHT	SHEET 2

DIETZGEN-POST CLEARPRINT

THE INFORMATION DISCLOSED HEREIN WAS ORIGINATED BY AND IS THE PROPERTY OF NON-LINEAR SYSTEMS INC., AND EXCEPT FOR RIGHTS EXPRESSLY GRANTED TO THE UNITED STATES GOVERNMENT, NON-LINEAR SYSTEMS INC. RESERVES ALL PATENT, PROPRIETARY, DESIGN, USE, SALE, MANUFACTURING AND REPRODUCTION RIGHTS THERETO.

REVISIONS					
SYM	ZONE	EFFECT.	DESCRIPTION	DATE	APPROVED



6. POWER SUPPLY VOLTAGES SHOWN ARE IN VOLTS D.C. AVERAGE VALUE WITH 115VAC LINE AND THE APPROXIMATE CURRENTS SHOWN. TYPICAL LINE FREQUENCY RIPPLE IS SHOWN IN BRACKETS IN VOLTS PEAK-TO-PEAK. OTHER AC VOLTAGES ARE IN VOLTS-RMS.
5. ALL Q'S = TRANSISTORS
   ALL C'S = CAPACITORS
   ALL R'S = RESISTORS
   ALL CR'S = DIODES
4. REFERENCE DESIGNATIONS ARE ABBREVIATED. PREFIX THE DESIGNATION WITH THE UNIT NUMBER OR ASSEMBLY DESIGNATION OR BOTH.
3. ALL TRANSISTORS ARE 2N1305
2. ALL DIODES ARE NLS 5003-002
1. ALL RESISTORS ARE ½W, 5%, CARBON

NOTES: UNLESS OTHERWISE SPECIFIED,

42-83 SH2
1

QTY REQD	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	MFR. CODE	CIRCUIT REF.	ITEM NO.	NEXT ASSY.	FINAL ASSY.	NEXT ASSY.	FINAL ASSY.
		PARTS LIST				APPLICATION		QTY.	
						58			
						92-62,60			1

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
TOLERANCES ON
DECIMALS ± .010 | ANGLES ± 0° 30'
FRACTIONS ± 1/32
SURFACE ROUGHNESS PER MIL-STD-10
DO NOT SCALE THIS DRAWING
RELEASE DATE 6-15-65

DRAWN [illegible] 1/22/65
CHECK [illegible] 1-26-65
APPR [illegible] 1-26-65
MATERIAL
FINISH

NON-LINEAR SYSTEMS, INC.
DEL MAR, CALIFORNIA

-SCHEMATIC DIAGRAM- A1 POWER SUPPLY

MODEL: 4200 SERIES

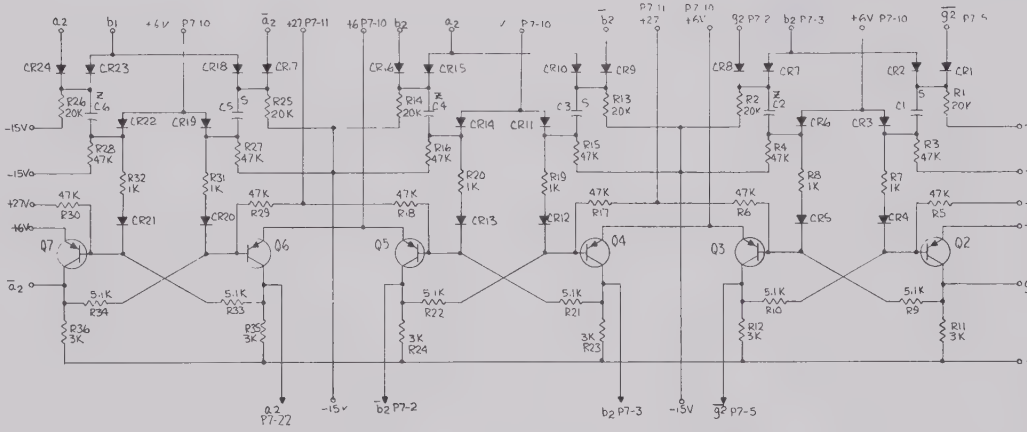
CODE IDENT NO. 03626 | SIZE D | 42-83
SCALE | WEIGHT | SHEET 2

DIETZGEN POST CLEARPRINT 1000H-10

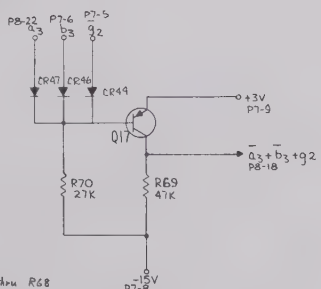
THE INFORMATION DISCLOSED HEREIN WAS ORIGINATED BY AND IS THE PROPERTY OF NON-LINEAR SYSTEMS INC. AND EXCEPT FOR RIGHTS EXPRESSLY GRANTED TO THE UNITED STATES GOVERNMENT, NON-LINEAR SYSTEMS INC. RESERVES ALL PATENT, PROPRIETARY, DESIGN, USE, SALE, MANUFACTURING AND REPRODUCTION RIGHTS THERETO.

REVISIONS					
SYM	ZONE	EFFECT.	DESCRIPTION	DATE	APPROVED

COUNTER 2

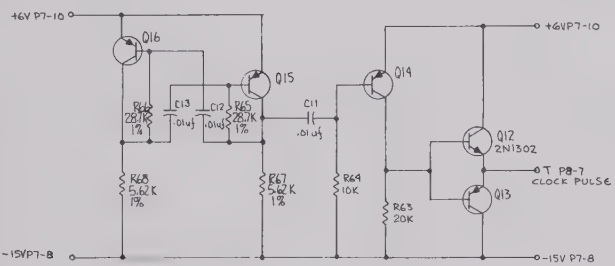


RESET BUFFER

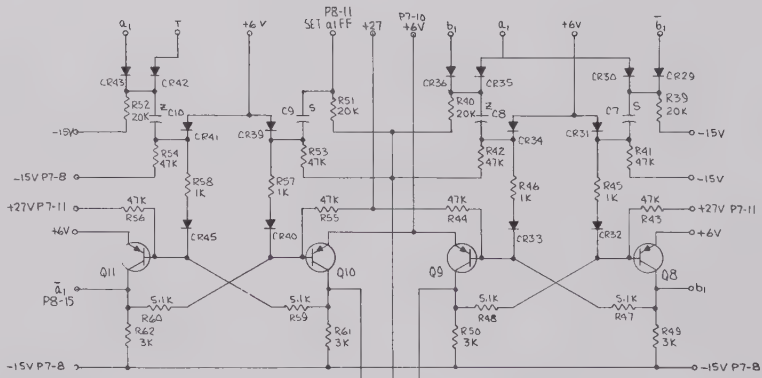


7. Resistors R65 thru R68 may be 1/4 or 1/2 watt.
6. A? Q's = TRANSISTORS
   A? C's = CAPACITORS
   A? R's = RESISTORS
   A? CR's = DIODES
5. REFRENCE DESIGNATIONS ARE ABBREVIATED. PREFIX THE DESIGNATION WITH THE UNIT NUMBER OR ASSEMBLY DESIGNATION OR BOTH.
4. ALL TRANSISTORS 2N1305
3. ALL DIODES NLS 5003-002
2. ALL CAPACITORS 0.001 uf, 1000 V
1. ALL RESISTORS 1/4 W, 5% CARBON

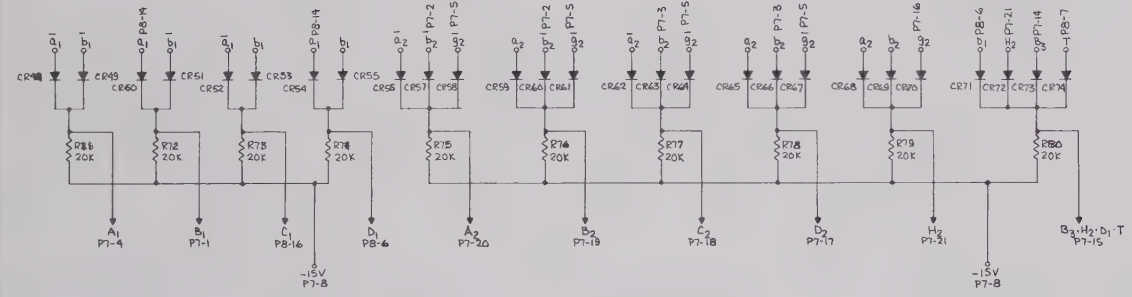
NOTES: UNLESS OTHERWISE SPECIFIED.



FMV



42-86 SH2



COUNTER 1

QTY REQD	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	MFR. CODE	CIRCUIT REF.	ITEM NO.	NEXT ASSY.	FINAL ASSY.	NEXT ASSY.	FINAL ASSY.
		PARTS LIST				APPLICATION		QTY.	
						—	42-57062	—	1

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
TOLERANCES ON
DECIMALS ± .010 ANGLES ± 0° 30'
FRACTIONS ± 1/32
SURFACE ROUGHNESS PER MIL-STD-10 ✓
DO NOT SCALE THIS DRAWING
RELEASE DATE 2/18/65

DRAWN Lindhorst 12/7/65
CHECK Bruce 1-26-65
APPR Hoffmann 1-21-65
MATERIAL
FINISH

NON-LINEAR SYSTEMS, INC.
DEL MAR, CALIFORNIA

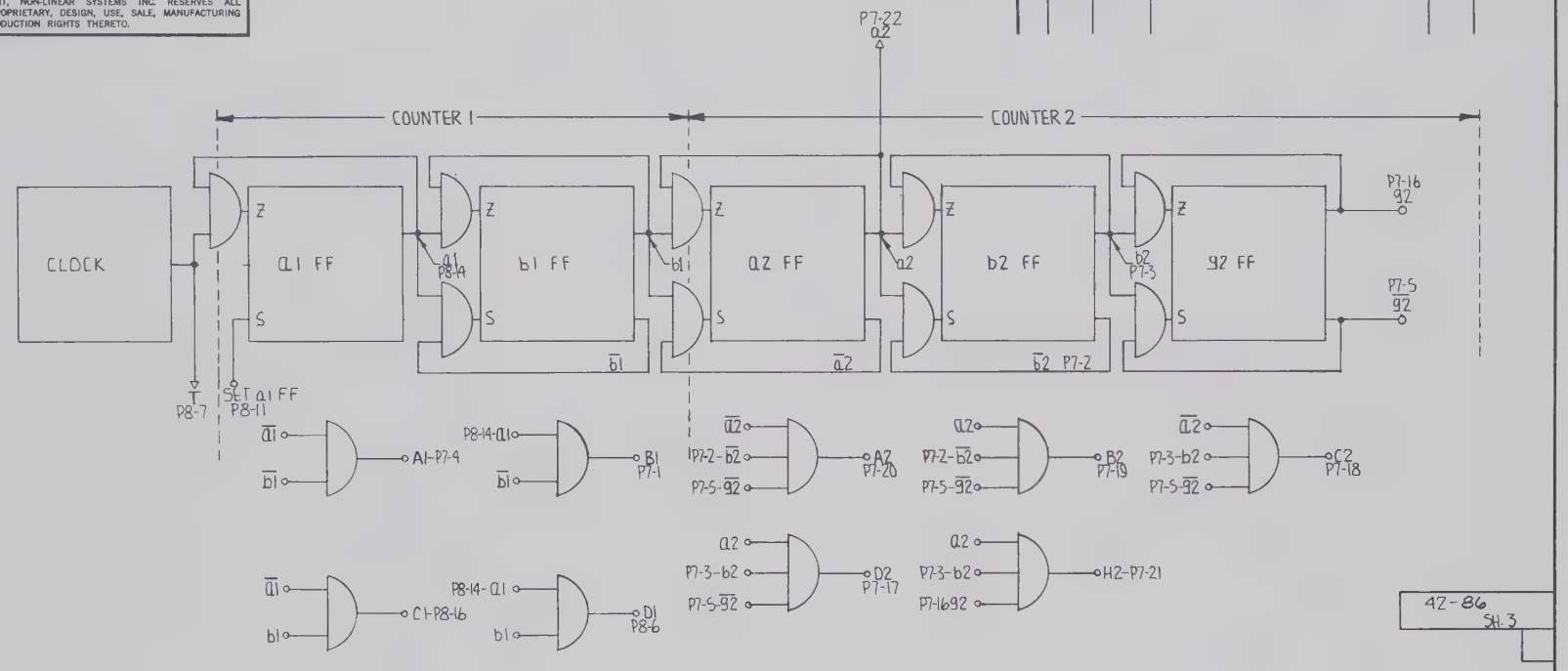
-SCHEMATIC DIAGRAM- A7-COUNTERS 1 & 2

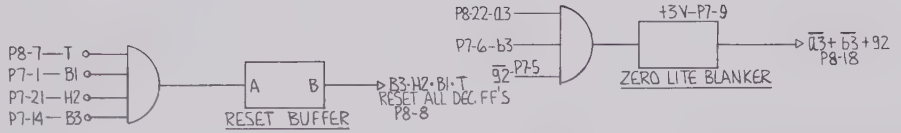
MODEL: SERIES 4200

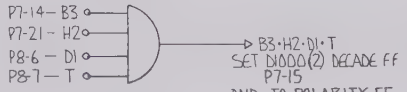
CODE IDENT NO. 03626 | SIZE D | 42-86 | SCALE | WEIGHT | SHEET 2

THE INFORMATION DISCLOSED HEREIN WAS ORIGINATED BY AND IS THE PROPERTY OF NON-LINEAR SYSTEMS INC., AND EXCEPT FOR RIGHTS EXPRESSLY GRANTED TO THE UNITED STATES GOVERNMENT, NON-LINEAR SYSTEMS INC. RESERVES ALL PATENT, PROPRIETARY, DESIGN, USE, SALE, MANUFACTURING AND REPRODUCTION RIGHTS THERETO.

REVISIONS					
SYM	ZONE	EFFECT.	DESCRIPTION	DATE	APPROVED







1. P0-00 = PIN NUMBERS
NOTES: UNLESS OTHERWISE SPECIFIED.

QTY REQD	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	MFR. CODE	CIRCUIT REF.	ITEM NO.	NEXT ASSY.	FINAL ASSY.	NEXT ASSY.	FINAL ASSY.
PARTS LIST						APPLICATION		QTY.	
						FINAL	42-62 to 57	1	1

UNLESS OTHERWISE SPECIFIED	DRAWN	1/22/65
DIMENSIONS ARE IN INCHES	CHECK	1-26-65
TOLERANCES ON DECIMALS ± .010 FRACTIONS ± 1/32 ANGLES ± 0° 30'	APPR	1-26-65
SURFACE ROUGHNESS PER MIL-STD-10 ✓	MATERIAL	
DO NOT SCALE THIS DRAWING	FINISH	
RELEASE DATE 2-18-65		

NON-LINEAR SYSTEMS, INC.
DEL MAR, CALIFORNIA

COUNTERS 1 AND 2 — BLOCK DIAGRAM

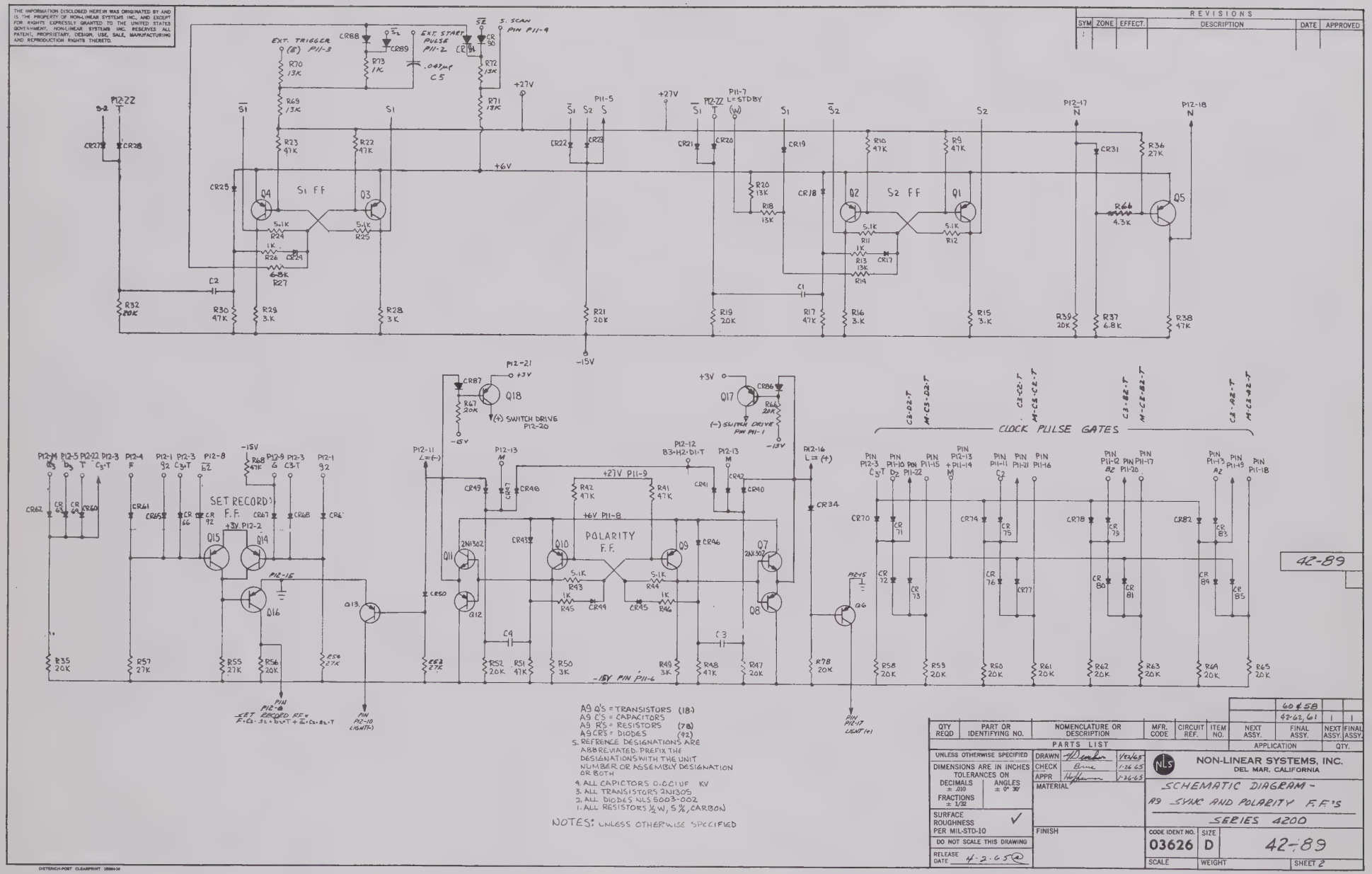
SERIES 4200

CODE IDENT NO.	SIZE	
03626	C	42-86
SCALE	WEIGHT	SHEET 3

DIETERICH-POST CLEARPRINT 1000H-10

THE INFORMATION DISCLOSED HEREIN WAS ORIGINATED BY AND IS THE PROPERTY OF NON-LINEAR SYSTEMS INC., AND EXCEPT FOR RIGHTS EXPRESSLY GRANTED TO THE UNITED STATES GOVERNMENT, NON-LINEAR SYSTEMS INC. RESERVES ALL PATENT, PROPRIETARY, DESIGN, USE, SALE, MANUFACTURING AND REPRODUCTION RIGHTS THEREIN.

REVISIONS					
SYM	ZONE	EFFECT	DESCRIPTION	DATE	APPROVED



A9 Q's = TRANSISTORS (18)
A9 C's = CAPACITORS
A9 R's = RESISTORS (78)
A9 CR's = DIODES (92)

5. REFRENCE DESIGNATIONS ARE ABBREVIATED. PREFIX THE DESIGNATIONS WITH THE UNIT NUMBER OR ASSEMBLY DESIGNATION OR BOTH
4. ALL CAPICTORS 0.001UF KV
3. ALL TRANSISTORS 2N1305
2. ALL DIODES NLS 5003-002
1. ALL RESISTORS ½W, 5%, CARBON

NOTES: UNLESS OTHERWISE SPECIFIED

42-89

QTY REQD	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	MFR. CODE	CIRCUIT REF.	ITEM NO.	NEXT ASSY.	FINAL ASSY.	NEXT ASSY.	FINAL ASSY.
		PARTS LIST				60 & 58			
						42-62, 61			
						APPLICATION		QTY.	

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
TOLERANCES ON
DECIMALS ± .010 ANGLES ± 0° 30'
FRACTIONS ± 1/32
SURFACE ROUGHNESS PER MIL-STD-10 ✓
DO NOT SCALE THIS DRAWING
RELEASE DATE 4-2-65

DRAWN	Vickes	1-26-65
CHECK	Bane	1-26-65
APPR	Hoffman	1-26-65

MATERIAL
FINISH

NON-LINEAR SYSTEMS, INC.
DEL MAR, CALIFORNIA

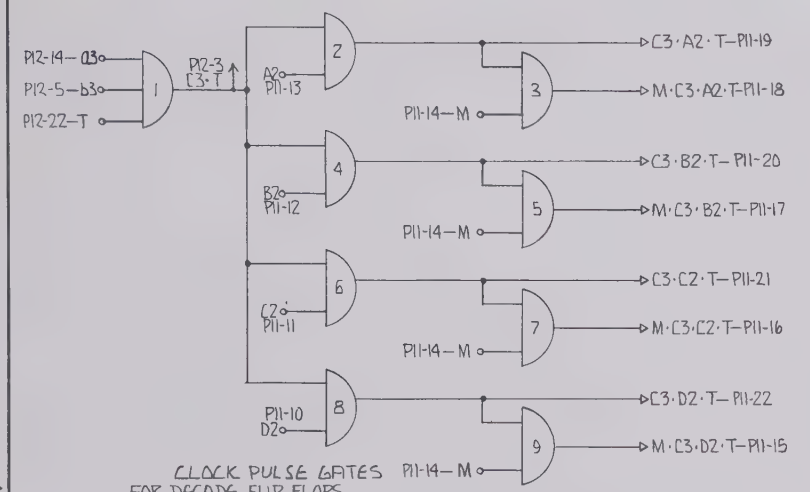
SCHEMATIC DIAGRAM -
A9 SYNC AND POLARITY F.F.'S
SERIES 4200

CODE IDENT NO.	SIZE	
03626	D	42-89
SCALE	WEIGHT	SHEET 2

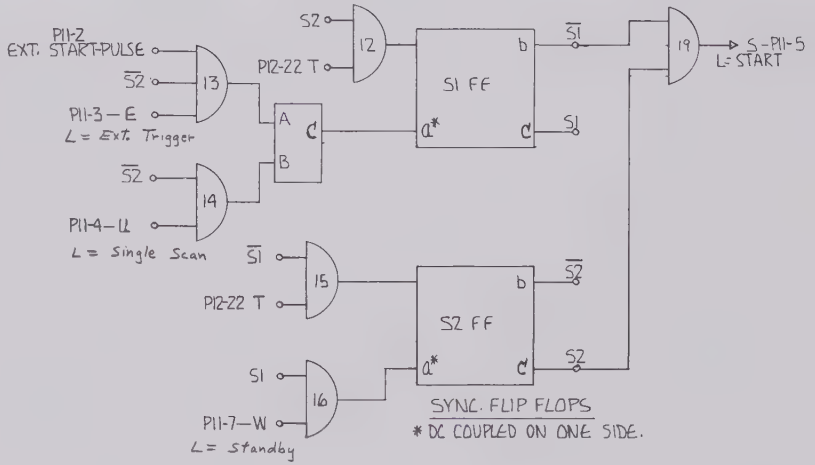
DIETZGEN-POST CLEARPRINT 1000H-50

THE INFORMATION DISCLOSED HEREIN WAS ORIGINATED BY AND IS THE PROPERTY OF NON-LINEAR SYSTEMS INC., AND EXCEPT FOR RIGHTS EXPRESSLY GRANTED TO THE UNITED STATES GOVERNMENT, NON-LINEAR SYSTEMS INC. RESERVES ALL PATENT, PROPRIETARY, DESIGN, USE, SALE, MANUFACTURING AND REPRODUCTION RIGHTS THERETO.

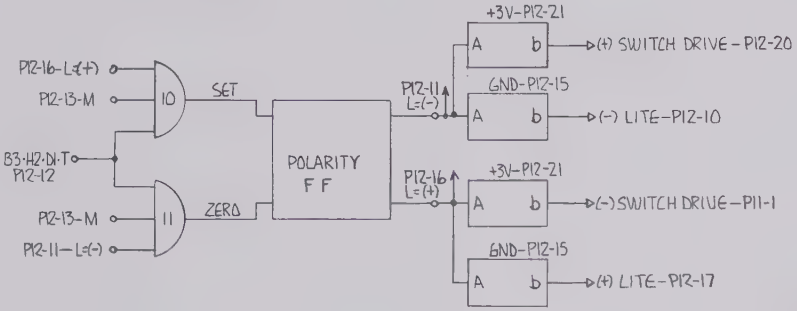
REVISIONS					
SYM	ZONE	EFFECT.	DESCRIPTION	DATE	APPROVED

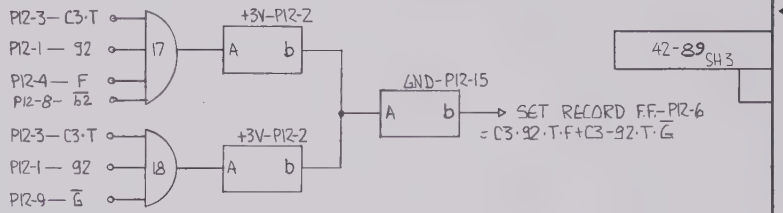


CLOCK PULSE GATES FOR DECADE FLIP FLOPS



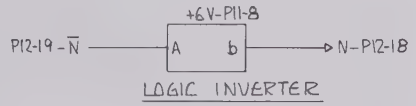
SYNC. FLIP FLOPS
* DC COUPLED ON ONE SIDE.





42-89 SH3

NOTES: 1. P00-00 = PIN NUMBERS UNLESS OTHERWISE SPECIFIED.



LOGIC INVERTER

								60 & 58		
							FINAL	42-62, 61,	1	1
QTY REQD	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	MFR. CODE	CIRCUIT REF.	ITEM NO.	NEXT ASSY.	FINAL ASSY.	NEXT ASSY.	FINAL ASSY.
PARTS LIST						APPLICATION		QTY.	

UNLESS OTHERWISE SPECIFIED	DRAWN	Deuchars	1-22-65
DIMENSIONS ARE IN INCHES TOLERANCES ON DECIMALS ± .010 FRACTIONS ± 1/32 ANGLES ± 0° 30'	CHECK	Tsue	1-26-65
	APPR	Hoffmeier	1-26-65
	MATERIAL		
SURFACE ROUGHNESS PER MIL-STD-10 ✓	FINISH		
DO NOT SCALE THIS DRAWING			
RELEASE DATE 2/18/65			

NON-LINEAR SYSTEMS, INC.
DEL MAR, CALIFORNIA

SYNC, POLARITY F.F.'S-BLOCK DIAGRAM

SERIES 4200

CODE IDENT NO.	SIZE	
03626	C	42-89
SCALE	WEIGHT	SHEET 3

DIETERICH-POST CLEARPRINT 1000H-10

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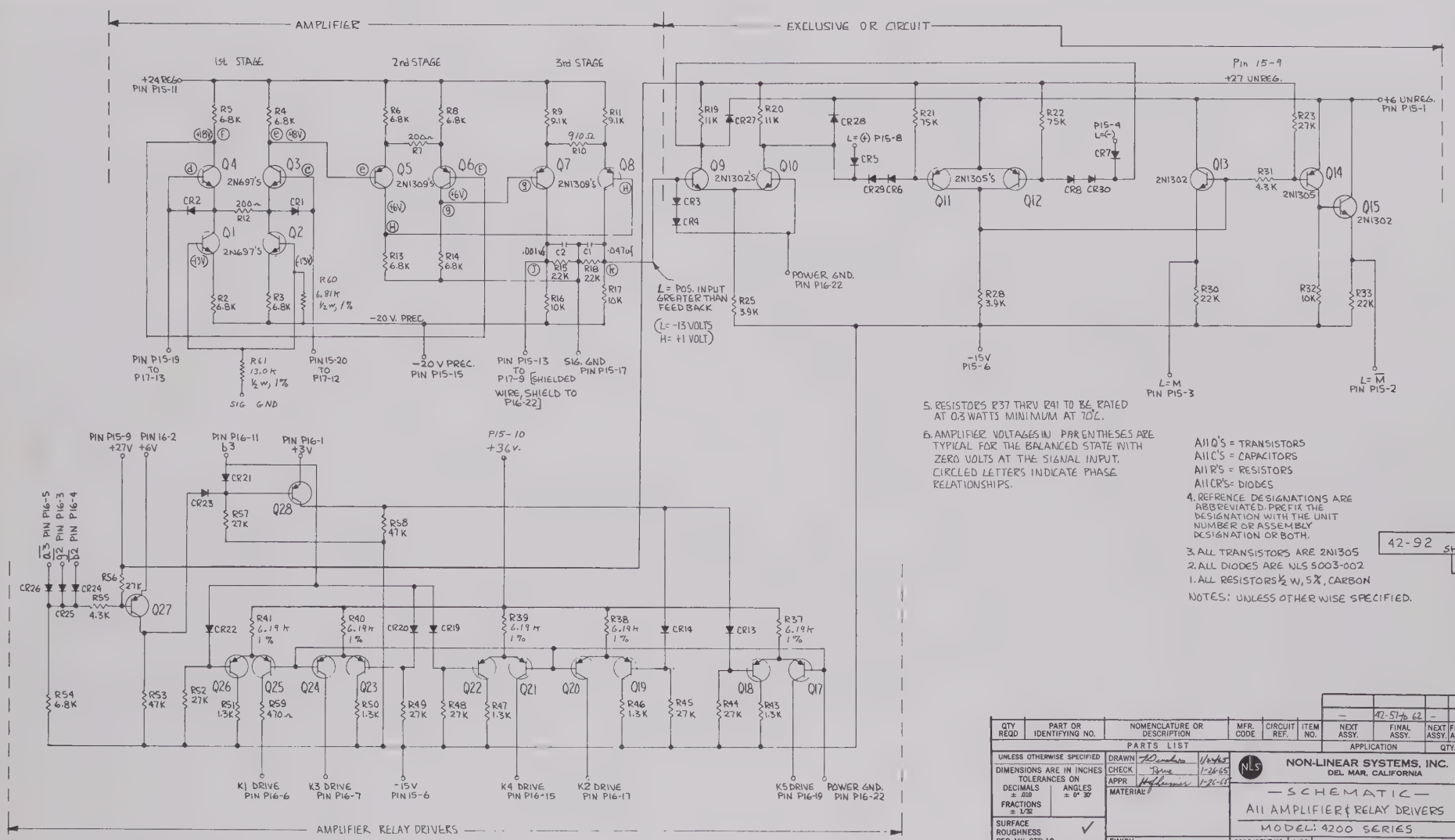
REVISIONS					
SYM	ZONE	EFFECT.	DESCRIPTION	DATE	APPROVED
1					



5. RESISTORS R37 THRU R41 TO BE RATED AT 0.3 WATTS MINIMUM AT 70°C.

6. AMPLIFIER VOLTAGES IN PARENTHESES ARE TYPICAL FOR THE BALANCED STATE WITH ZERO VOLTS AT THE SIGNAL INPUT. CIRCLED LETTERS INDICATE PHASE RELATIONSHIPS.

A11Q'S = TRANSISTORS
A11C'S = CAPACITORS
A11R'S = RESISTORS
A11CR'S= DIODES

4. REFRENCE DESIGNATIONS ARE ABBREVIATED. PREFIX THE DESIGNATION WITH THE UNIT NUMBER OR ASSEMBLY DESIGNATION OR BOTH.

3. ALL TRANSISTORS ARE 2N1305
2. ALL DIODES ARE NLS 5003-002
1. ALL RESISTORS ½ W, 5%, CARBON

NOTES: UNLESS OTHERWISE SPECIFIED.

42-92 SH2

QTY REQD	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	MFR. CODE	CIRCUIT REF.	ITEM NO.	NEXT ASSY.	FINAL ASSY.	NEXT ASSY.	FINAL ASSY.
		PARTS LIST				—	42-51 to 62	—	1
						APPLICATION		QTY.	

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
TOLERANCES ON
DECIMALS ± .010
ANGLES ± 0° 30'
FRACTIONS ± 1/32
SURFACE ROUGHNESS PER MIL-STD-10 ✓
DO NOT SCALE THIS DRAWING
RELEASE DATE 1/12/65

DRAWN	[illegible]	1/12/65
CHECK	[illegible]	1-26-65
APPR	[illegible]	1-26-65

MATERIAL
FINISH

NON-LINEAR SYSTEMS, INC.
DEL MAR, CALIFORNIA

— SCHEMATIC —
A11 AMPLIFIER & RELAY DRIVERS
MODEL 4200 SERIES

CODE IDENT NO. 03626 | SIZE D | 42-92
SCALE | WEIGHT | SHEET 2

DIETZGEN-POST CLEARPRINT 3000H-30

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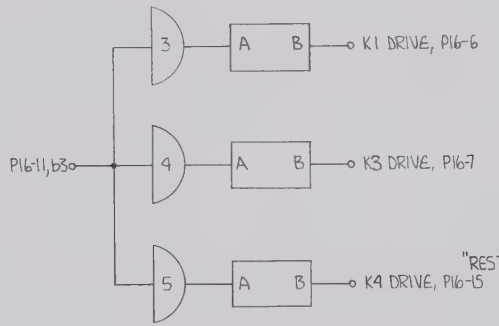
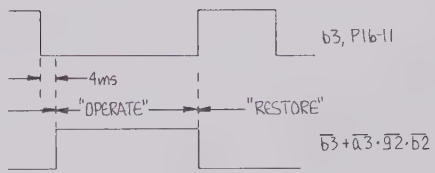
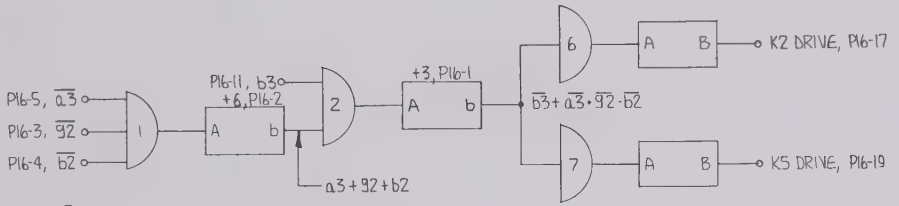
REVISIONS					
SYM	ZONE	EFFECT.	DESCRIPTION	DATE	APPROVED

CONSTANT CURRENT DRIVES, L= RELAY DE-ENERGIZED



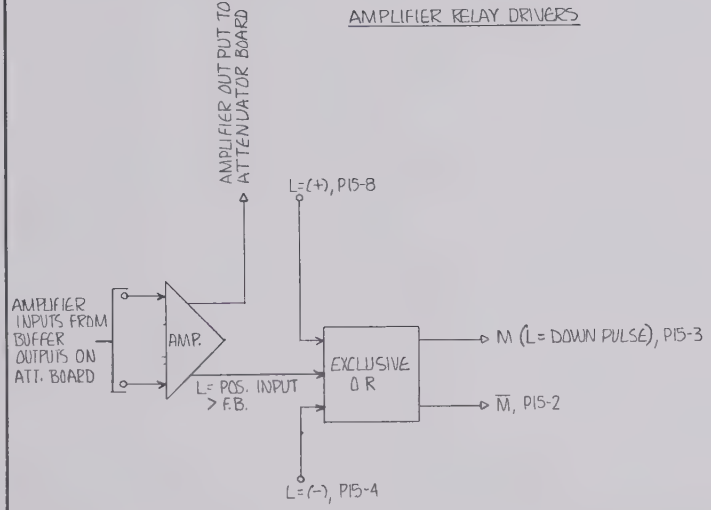


RELAY TIMING DIAGRAM



AMPLIFIER RELAY DRIVERS

42-92 Sh 3



QTY REQD	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	MFR. CODE	CIRCUIT REF.	ITEM NO.	NEXT ASSY.	FINAL ASSY.	NEXT ASSY.	FINAL ASSY.
		PARTS LIST				APPLICATION		QTY.	
						FINAL	92-62	1	1

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
TOLERANCES ON
DECIMALS ± .010 | ANGLES ± 0° 30'
FRACTIONS ± 1/32
SURFACE ROUGHNESS PER MIL-STD-10 ✓
DO NOT SCALE THIS DRAWING
RELEASE DATE 2/18/65

DRAWN	Deuchars	1-22-65
CHECK	Bove	1-26-65
APPR	Hoffheimer	1-26-65

MATERIAL
FINISH

NON-LINEAR SYSTEMS, INC.
DEL MAR, CALIFORNIA

AMPLIFIER, RELAY DRIVERS; BLOCK DIAGRAM

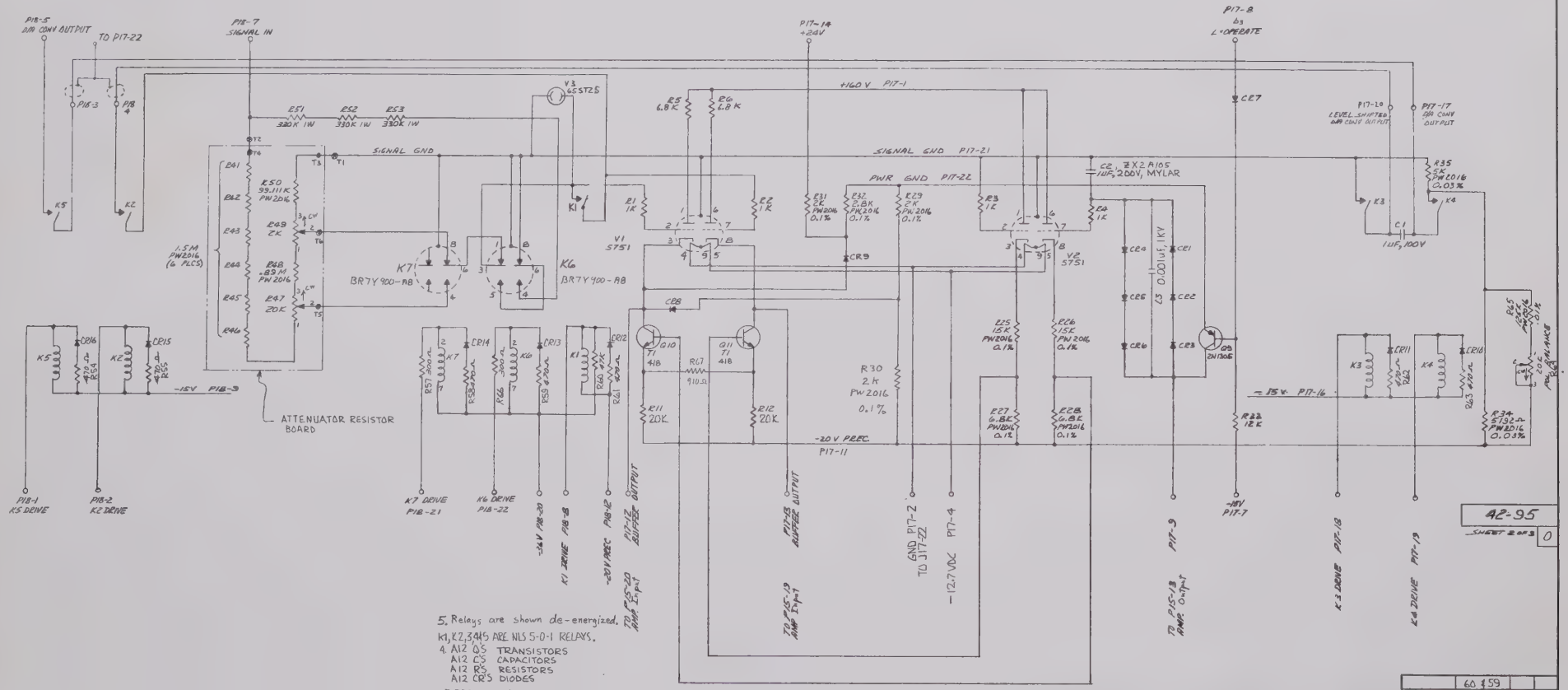
SERIES 9200

CODE IDENT NO.	SIZE	
03626	C	42-92
SCALE	WEIGHT	SHEET 3

DIETERICH-POST CLEARPRINT 1000H-10

THE INFORMATION CONTAINED HEREIN WAS ORIGINATED BY AND IS THE PROPERTY OF NON-LINEAR SYSTEMS INC. AND EXCEPT AS SPECIFICALLY RIGHTS EXPRESSLY GRANTED TO THE UNITED STATES GOVERNMENT NON-LINEAR SYSTEMS INC. RESERVES ALL PATENT, PROPRIETARY, DESIGN, USE, SALE, MANUFACTURING AND REPRODUCTION RIGHTS THERETO

REVISIONS					
SYM	ZONE	EFFECT.	DESCRIPTION	DATE	APPROVED



5. Relays are shown de-energized.

K1, K2, 3, 4, 5 ARE NLS 5-0-1 RELAYS.

4. A12 Q's TRANSISTORS
A12 C's CAPACITORS
A12 R's RESISTORS
A12 CR's DIODES

3. REFRENCE DESIGNATIONS ARE ABBREVIATED. PREFIX THE DESIGNATION WITH THE UNIT NUMBER OR ASSEMBLY DESIGNATON OR BOTH.

2. ALL DIODES ARE NLS 5003-002

1. ALL RESISTORS ½ W, 5%, CARBON

NOTES: UNLESS OTHERWISE SPECIFIED.

42-95
SHEET 2 OF 3 0

									60 & 59		
								—	42-62, 61		1
QTY REQD	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	MFR. CODE	CIRCUIT REF.	ITEM NO.	NEXT ASSY.	FINAL ASSY.	NEXT ASSY.	FINAL ASSY.
PARTS LIST						APPLICATION		QTY.	

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
TOLERANCES ON
DECIMALS ± .010 | ANGLES ± 0° 30'
FRACTIONS ± 1/32
SURFACE ROUGHNESS PER MIL-STD-10 ✓
DO NOT SCALE THIS DRAWING
RELEASE DATE 2/18/65

DRAWN 11/2/65
CHECK 2-26-65
APPR 1-26-65
MATERIAL
FINISH

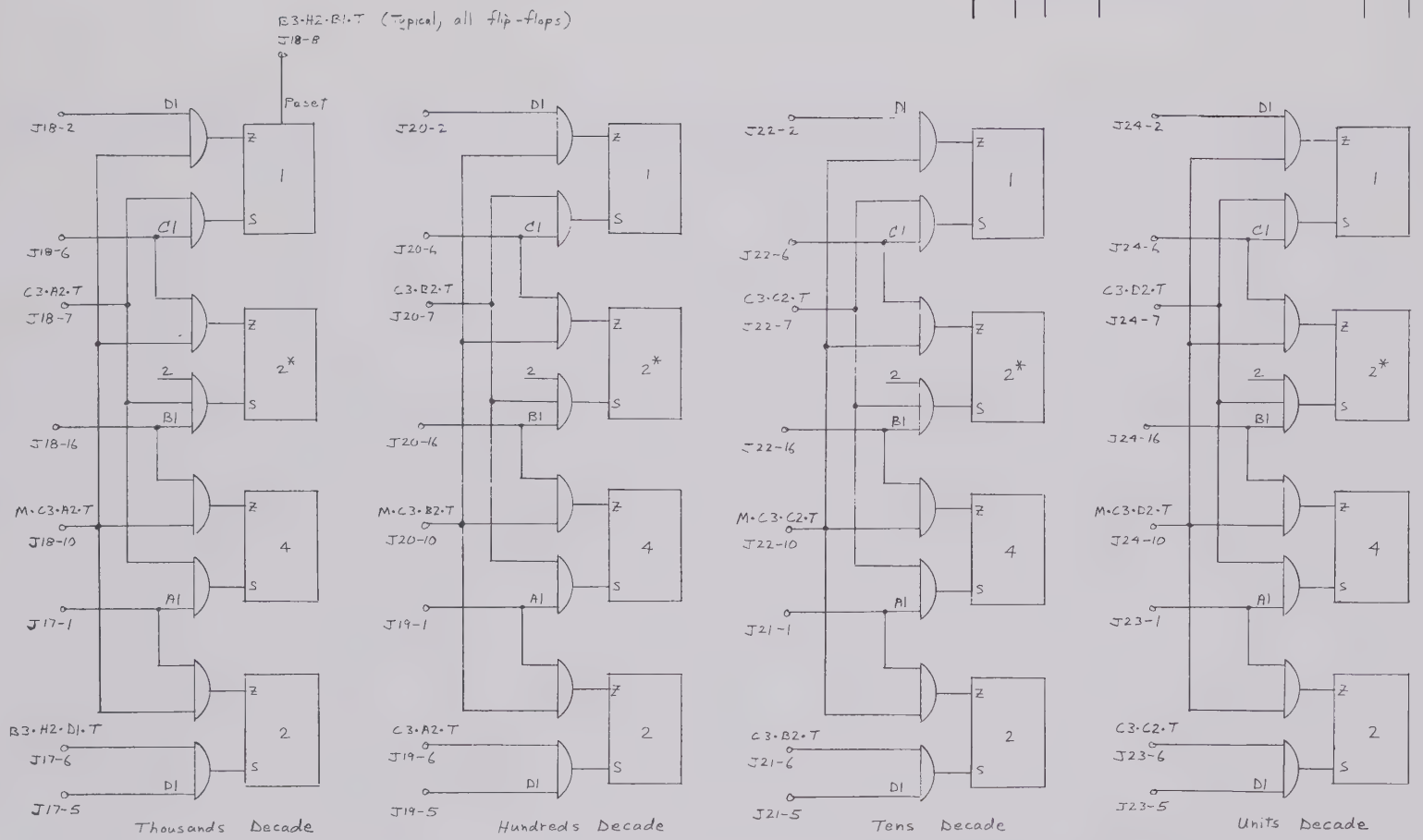
NON-LINEAR SYSTEMS, INC.
DEL MAR, CALIFORNIA

SCHEMATIC DIAGRAM -
A12 - ATTENUATOR
MODEL: SERIES 4200

CODE IDENT NO.	SIZE	
03626	D	42-95
SCALE	WEIGHT	SHEET 2

DIETERICH-POST CLEARPRINT 120864-50

REVISIONS					
ZONE	LTR.	EFFECT.	DESCRIPTION	DATE	APPROVED



QTY REQD	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	MFR. CODE	CIRCUIT REF.	ITEM NO.

PARTS LIST

UNLESS OTHERWISE SPECIFIED	CONTR. NO.	
DIMENSIONS ARE IN INCHES TOLERANCES ON DECIMALS ± .010 ANGLES ± 0° 30' FRACTIONS ± 1/32	DRAWN	Rima 8-25-65
	CHECK	
	APPR	Hoffmann 8-25-65
	RELEASE DATE	8-25-65

NON-LINEAR SYSTEMS, INC.
DEL MAR, CALIFORNIA

BLOCK DIAGRAM
Decade Flip-Flops
Series 4200

SIZE	CODE IDENT NO.	
C	03626	42-190

SCALE | WEIGHT | SHEET 1

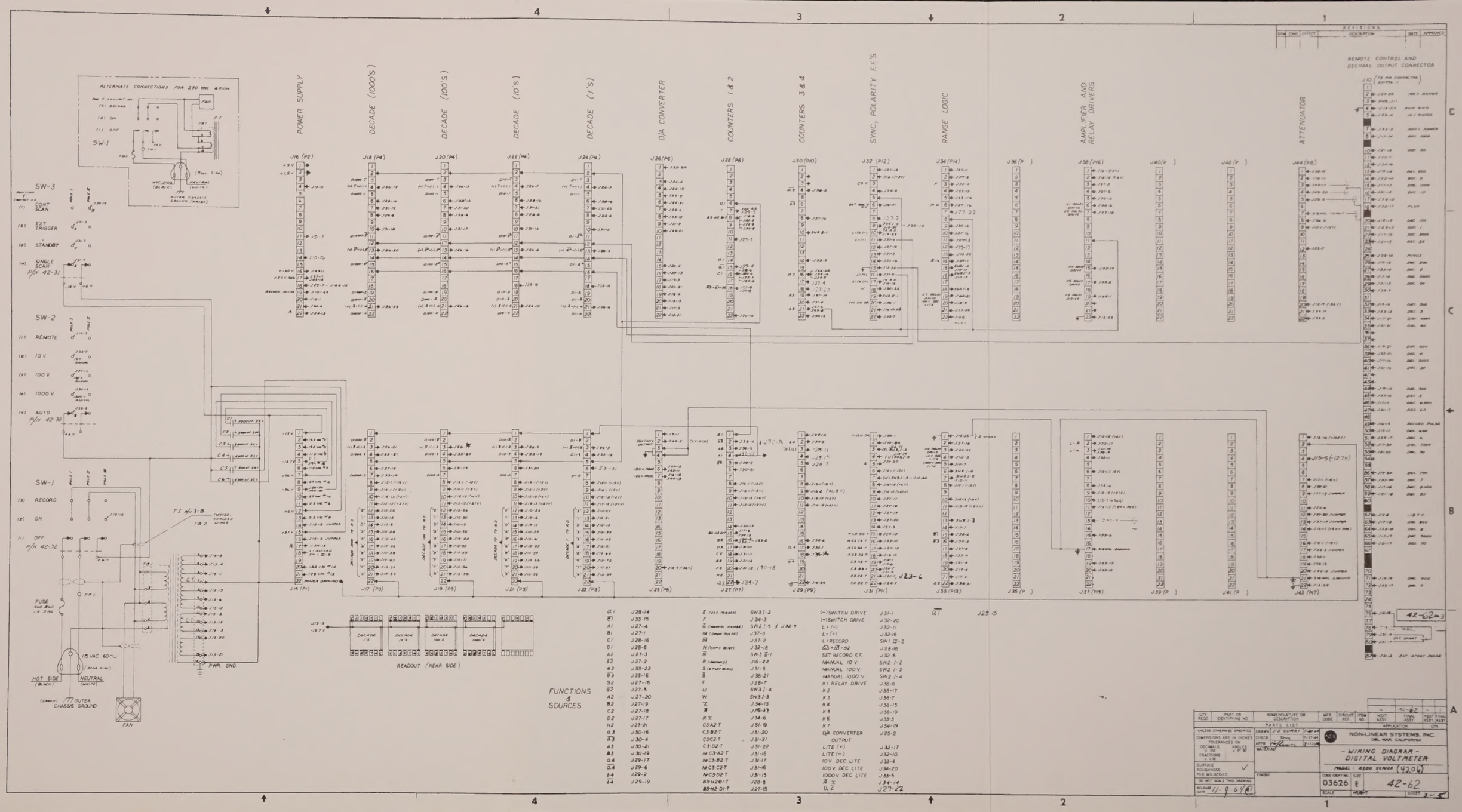
MATERIAL

NEXT ASSY.	FINAL ASSY.	NEXT ASSY.	FINAL ASSY.
APPLICATION		QTY.	

42-190

10/64 DIETERICH-POST CLEARPRINT 1000H-10

445


ALTERNATE CONNECTIONS FOR 230 VAC 60CPS
SW-1
SW-3
SW-2
POWER SUPPLY
DECADE (1000'S)
DECADE (100'S)
DECADE (10'S)
DECADE (1'S)
D/A CONVERTER
COUNTERS 1 & 2
COUNTERS 3 & 4
SYNC, POLARITY F.F.'S
RANGE LOGIC
AMPLIFIER AND RELAY DRIVERS
ATTENUATOR
REMOTE CONTROL AND DECIMAL OUTPUT CONNECTOR
TI P/N 3-18
TB2
TB1
T1
FUSE
HOT SIDE (BLACK)
NEUTRAL (WHITE)
OUTER CHASSIS GROUND
FAN
PWR GND
READOUT (REAR SIDE)
FUNCTIONS & SOURCES
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MODEL 4200 SERIES (4206)
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42-62

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